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Prefrontal Lobotomy: Complications and Their Treatment*†

JAMES W. WATTS, M.D., F.A.C.S., F.I.C.S.

AND

WALTER FREEMAN, M.D., F.A.C.P.

WASHINGTON, D. C.

PREFRONTAL lobotomy is a simple but precise operation. As soon as the nurses and anesthetists become accustomed to handling mental patients the operation proceeds quickly and smoothly. We have operated upon 531 patients a total of 610 times, with only 12 operative deaths. It has been necessary to terminate the operation before completion because of some complication in only 4 cases. Ordinarily, there is very little shock, and very slight loss of blood. In a few cases the blood pressure may fall considerably after the avertin is administered, and in others there is a definite fall in pressure after the prefrontal white matter is cut (Case 83). Stimulants are unnecessary in such cases, since the pulse and color remain normal. All that is required is to lower the table to the horizontal position.

Of the 531 patients upon whom prefrontal lobotomy was performed between September 1936 and July 1937, we have lost track of only two. We have made follow-up examinations or received reports on all the rest during the past year. The cases are numbered in chronological order, so that the first patient operated upon in 1936 is Case 1, and the last operated upon in July 1947 is Case 531. This method allows us to tell at a glance just where in the series a complication occurred.

OPERATION TERMINATED BEFORE COMPLETION

Prefrontal lobotomy was terminated before the operation was complete in four patients. During his third operation, one patient (Case 84) became restless, pulled the drapes loose, and contaminated the operative field, so that it was thought advisable not to proceed. The fourth operation, under general anesthesia, was successful. In a case of involutional depression (Case 8), while working on the first side, the blade of the Moniz leucotome broke and had to be withdrawn through an enlarged incision in the cortex, so we decided not to continue on the other side. There was no improvement. While performing a radical lobotomy in a schizophrenic (Case 320) subcortical bleeding occurred on the left side and respirations became irregular and shallow. We stopped operating after one side was completed and by the time the wound was closed, his condition was satisfactory. We proceeded with the second side six weeks later with a successful outcome. A patient with a tension state (Case 115) was being operated upon under local anesthesia for the third time when he became tense and restless. When sodium pentothal was injected intravenously he developed a severe laryngeal spasm and required the administration of oxygen and artificial respiration; large quantities of mucus had to be aspirated, and the operation was interrupted. The second side was operated upon a few days later. The man finally has been relieved of his severe neurosis, but because of his erratic behavior must be confined in an institution.

OPERATIVE HEMORRHAGE

A survey of our operative notes indicates that bleeding was considered more than usual in 23 cases. In one patient (Case 52) bleeding from the dura was followed by a fall

* Read before the Twelfth National Assembly, United States Chapter, International College of Surgeons, Chicago, Sept. 28–Oct. 4, 1947.

† From the Department of Neurology and Neurological Surgery, George Washington University Medical School.

in blood pressure. In 5 cases bleeding from a superficial cortical vein proved troublesome, and in one (Case 68) it was necessary to rongeur additional bone in order to secure hemostasis. There was excessive bleeding from the subcortical incisions in 17 instances, but it was necessary to enlarge the bony opening to control such bleeding in only 5. In the other 12 cases, with a brain cannula in the incision it was irrigated repeatedly with saline solution until the fluid returned clear. Usually it required 5 to 15 minutes of washing before we were satisfied with hemostasis. When bleeding occurred, and there was no bulging of the brain through the defect, and the pulse and respiration remained normal, we contented ourselves with washing. If the brain bulged through the dural opening, or the respirations became slow or irregular we immediately enlarged the bony opening, incised the dura and cortex, and allowed the blood to flow out. We packed the subcortical incision with cottonoid and in the meantime inserted a cannula into the opposite ventricle and started blood transfusion. Then with a lighted retractor and suction we located the bleeding point. In a young man with schizophrenia (Case 326) we packed the wound with cottonoid and removed the packing three days later. Prolonged inertia followed in this case. Probably a branch of the anterior cerebral artery was severed, since the lower limbs were paralyzed for a time. In another patient (Case 72), while operating under local anesthesia, the anterior cerebral artery was lacerated by the left upward cut.

This disaster was followed by an exclamation—"Oh my!," and she vomited and lapsed into unconsciousness. The pulse fell to 52, respiration was rapid and stertorous, her color was dusky and she perspired profusely. There were generalized tremors—almost a convulsion. Blood pressure rose from 110/80 to 140/90.

At first, bright blood spurted from the cannula, but soon the brain began to bulge. When the opposite ventricle was tapped, clear fluid spurted from the needle under high pressure. In this desperate situation the surgeon opened the bone widely and through a large transcortical approach worked his way down to the median longitudinal fissure. There he saw the *right* anterior cerebral artery pulsating. Bleeding from the left artery ceased when the blood pressure fell to 100/60. Two transfusions of 500 cc. each, and 1,500 cc. saline were administered before the patient's condition was considered satisfactory. Recovery was slow and incomplete and death in status epilepticus occurred four months later.

CORTICAL ATROPHY

Definite cortical atrophy was observed during operation in 10 patients. In two individuals (Cases 182 and 277) there was a history of two or three previous cerebral vascular accidents. One patient (Case 300) had a depressed fracture of the skull at the age of four, and there was a cerebral cicatrix underlying the skull defect. Another (Case 108) had a depressed fracture, with extensive underlying adhesions, from the kick of a mule. In six of the patients the cortical atrophy was an incidental finding. Four were elderly women with involutional depression (Cases 403, 209, 38 and 74). One was in the terminal stages of carcinoma (Case 490), and the sixth (Case 506) was a schizophrenic.

HEMIPARESIS

Four of the six patients in whom it was necessary to enlarge the bony opening for control of hemorrhage developed hemiparesis. In two (Cases 101 and 93) the weakness cleared up by the second postoperative day. In one (Case 72) there was persistent paralysis of the right lower limb and awkwardness of the right upper limb, but no aphasia. In another (Case 326) both legs were at first paralyzed and later developed spasticity. In one of our early cases (Case 21) the surgical incisions with the Moniz leucotome were placed too far posteriorly, producing left hemiparesis, transient right hemiathetosis, and explosive laughter. This patient recovered the use of her arm and forearm but after 10 years finer movements of the left hand are still impaired. Also, a trace of the laughter, a mild giggle which she cannot readily suppress, remains.

One patient (Case 247) developed a facial

paralysis while in the hospital, and another developed a facial and abducens weakness within a week after returning home (Case 14). In the latter case a low-grade wound infection probably was the cause. In both patients, the weakness disappeared in a short time. Transitory aphasia developed on the fifth postoperative day in our first patient (Case 1).

CHRONIC INTRACEREBRAL HEMATOMA

Three patients developed hematomas within the subcortical incisions, and one a hygroma. In two patients (Cases 30 and 133) there was sudden onset of coma, in one (Case 267) the onset was gradual, and one patient was extremely lethargic continuously from the day of her second lobotomy (Case 88). A woman with involutional depression (Case 30), was convalescing satisfactorily, but on the eleventh postoperative day, while sitting up in a wheel chair, suddenly went into coma. Because of the sudden onset, a cannula was inserted into the subcortical incisions and 10 to 15 cc. of brownish fluid, looking like that in a chronic subdural hematoma, was withdrawn from each side. By the next day the patient had recovered consciousness.

On the fifth postoperative day, one of our patients (Case 133) suddenly became cyanotic, the pulse dropped to 42, respirations became irregular, and the blood pressure could not be obtained. Within twenty minutes her condition was satisfactory, but a similar episode occurred the next day. She again became cyanotic, her respirations were labored and the systolic blood pressure dropped to 45 mm. Hg. A cannula was inserted into the lobotomy and 5 cc. of dark blood were withdrawn from each side. The patient improved promptly and when the subcortical incisions were tapped again the next day no blood was obtained from the right side and only 2 cc. from the left. Her convalescence thereafter was uneventful except for the subsequent development of convulsive attacks.

Following her second operation, one individual (Case 88) exhibited extreme inertia for two weeks, and this was the indication for tapping the incisions.

Another patient (Case 267) gradually became more stuporous and four days after operation the spinal fluid was grossly bloody and xanthochromic with the pressure elevated to 18 mm. Hg. The following day the spinal fluid pressure was still elevated and, since the patient was still stuporous, a cannula was inserted into the subcortical incision in each frontal lobe. Xanthochromic fluid was withdrawn from each side, 45 cc. on the left and 90 cc. on the right. Promptly after this the patient regained consciousness. The presence of this clear yellow fluid indicated that the cavities communicated with the ventricles.

OPERATIVE DEATHS

Twelve operative deaths, 2.3 per cent, occurred in the 531 patients operated upon. Secondary operations with no operative deaths were performed in 70 cases. This brings the total number of operations up to 610 with an operative mortality of slightly under 2 per cent. The primary cause of death is listed in Table 1.

TABLE 1. SURGICAL MORTALITY

Cause	Case
Postoperative hemorrhage	3
Meningitis or brain abscess	3
Inertia and atelectasis	2
Atelectasis	1
Peritonitis	1
Shock	1
Unknown	1
Total	12

Postoperative Hemorrhage. Postoperative hemorrhage occurred in Cases 20, 32 and 488. Two of the patients (Cases 20 and 32) were operated upon in 1936 and 1937, respectively, and are described in detail in the first edition of "Psychosurgery." The first death (Case 20) was due to massive intracerebral hemorrhage which occurred three hours after operation and the patient died on the seventh postoperative day. Autopsy in the second case (Case 32) revealed that a short perforating branch of the middle cerebral artery had been torn while making a spherical cut with the leucotome. There were no deaths due to

hemorrhage from 1937 until April, 1947, when a branch of the left middle cerebral artery was lacerated during the performance of a radical operation on a patient (Case 488). Autopsy revealed a clot filling both subcortical incisions and also the ventricles. Hemorrhage has been the cause of death in 0.5 per cent of the operative cases.

Meningitis, Brain Abscess, Wound Infection. Meningitis was the cause of death in 3 cases (Cases 208, 227 and 213). One woman (Case 208), in her agitated depression, had picked the hair from her scalp over two symmetrical portions near the coronal suture and pointed accurately to this region as the seat of her trouble. She developed a wound infection and meningitis two days after operation, and died on the seventh postoperative day. Autopsy revealed acute suppurative meningitis. This case taught us to avoid carefully areas of epilation due to hair pulling, and to place such patients on penicillin preoperatively. Two other serious infections followed this case and were traced to the use of iodized oil from the same vial—saved through a mistaken sense of economy. One of these caused the death of the patient (Case 227) but in the other instance (Case 225) the patient recovered under prompt sulfonamide therapy.

In one case (Case 213) brain abscess was associated with the meningitis. This patient who had schizophrenia and possible pituitary cachexia improved rapidly after operation; the mental symptoms disappeared and she gained ten pounds. On the fifth postoperative day, however, a wound infection was found on the right side and a spinal puncture revealed increased cell count and elevated pressure. She was operated upon three times for brain abscess and died two and one-half months after the lobotomy. The anatomic diagnosis at autopsy included meningitis, brain abscess, pituitary cachexia and bilateral lobar pneumonia.

Meningitis was present in three other cases but these patients recovered. One patient had a low-grade wound infection (Case 14) and developed a facial and abducens palsy as described earlier in this paper. Three other patients had superficial wound infections but they were not associated with neurologic findings.

In order to avoid infections we start prophylactic penicillin injections, 30,000 units intramuscularly every three hours, day and night for three days. Sometimes this of itself will cause a febrile reaction, but it is not serious. If signs of infection develop at a later period the dosage is stepped up to 50,000 units every three hours, and sulfadiazine is administered until the fever subsides or the blood level reaches 7 to 10 mg. per 100 cc. Precautionary measures are best.

Inertia. Extreme inertia in prefrontal lobotomy is considered the primary cause of death in two patients, although both had pulmonary complications. An elderly minister (Case 46) was operated upon under local anesthesia and became profoundly unconscious on the operating table. It was noted even at the time the incisions were made that the head had become extended and that the lower cuts went farther posteriorly than usual. The patient developed atelectasis and bronchopneumonia and died on the seventh postoperative day. A woman (Case 77) had postencephalitic parkinsonism with such marked rigidity and tremor that she was not able to walk. In the hope that the rigidity would be improved, she was operated upon Jan. 16, 1941, under local anesthesia and was quite lethargic on leaving the operating table. Although the tremor persisted unchanged, her condition was good until the eighth postoperative day when she suddenly went into coma. Her pulse was weak and her blood pressure 50/30. Ventricular tap was performed and yielded 60 cc. of bloody fluid. The patient improved temporarily but developed pulmonary edema and died on the fifteenth day. Autopsy revealed congestion of both lungs and a pulmonary infarct in the right lower lobe. There was no evidence of postoperative hemorrhage.

When inertia persists after the patient returns home, we tell the family that fair words will be of no avail, that physical application of *vis a tergo* will be necessary.

Many patients can be helped by the use of benzedrine, 10 mg. before breakfast and maybe once or twice later in the day. Some patients

can tolerate 50 mg. a day without discomfort, and the medication can be kept up for a long period. One of our patients (Case 132) continued her ration for two years and then found she could get along without it.

Benzedrine has the additional advantage of reducing the appetite and may thus help to control the patient's food intake. We have seen no harmful effects of prolonged administration of the drug. The difficulty usually resides in securing the cooperation of the patient (Case 389) in taking it regularly.

Atelectasis and Pneumonia. Atelectasis occurred in six patients and in two (Cases 46 and 271) it was a primary cause of the patient's death. In one patient (Case 271), the atelectasis may be attributed to an error in management. The patient was a 62-year-old woman with a catatonic excitement which had been present for 30 years. She was brought to the hospital under heavy sedation, having received four doses of morphine on the way. She took the anesthetic poorly, and the afternoon of operation the pulse was 140, blood pressure 178/40, and respirations 34. She was cyanotic and her breathing was difficult. Examination of the lungs showed evidence of atelectasis. The preoperative leukocyte count, which was 2000, first came to our attention after operation. No autopsy was performed.

Although they ran a rather stormy course, four patients (Cases 162, 219, 263, and 326) recovered.

The best treatment is preventive. The patients are turned in bed every two hours. When they are extremely inert, we sit them up in bed and pound on the back and chest to make them cough. Bronchoscopic aspiration was attempted in only one (Case 46), and it was unsuccessful.

Peritonitis. One patient (Case 182) died on the fourth postoperative day of peritonitis due to ruptured sigmoid diverticulum. This woman, who was 54 years of age, had rheumatic heart disease. In October, 1939, she had a series of cerebral emboli. The first affected her right side, and a few days later her left side became paralyzed. It was six months before she improved sufficiently to walk alone. About six weeks after the paralysis she began suffering disagreeable pains in the left side, particularly in the neck, and in the fingers of the left hand. The pain was so severe that she was confined to bed almost continuously. Lobotomy was performed June 15, 1943, in an attempt to alleviate the "thalamic" pain. There was considerable atrophy of the right frontal lobe. Following operation she was listless and sluggish, and winced considerably whenever the abdomen was touched. She no longer showed any reaction to manipulation of the painful left arm. Death occurred on the fourth postoperative day and autopsy revealed rupture of the sigmoid diverticulum and generalized peritonitis. It also revealed rheumatic heart disease with mitral stenosis and aortic insufficiency. The infarct of the brain on the right side involved the basal ganglia, but there was only secondary atrophy of the thalamus. The lobotomy incisions were clean.

Shock. A man with acute catatonic dementia praecox (Case 193) probably died of dehydration and shock. For five days before operation he had resisted efforts to administer liquids. We debated the safety of operation but decided to go ahead because of the danger of unrelieved catatonic stupor of such intensity. The pulse remained at 120 throughout the operation, and peripheral circulatory collapse made it necessary to cut down on veins to administer fluids. The patient nevertheless failed to regain consciousness and died on the seventh postoperative day. Necropsy was limited to the brain which revealed cerebral edema and clean operative wounds.

Cause of Death Unknown. This patient (Case 356) was a boy 12 years of age whose illness was classified as schizophrenia. There were no complications during a radical prefrontal lobotomy performed on Nov. 15, 1945, and his condition was satisfactory throughout the procedure. His reaction the following morning was most unusual. Apparently he was seeing things. At times there would be a look of stark terror on his face; then he might kiss the nurse on the arm or cheek, bite his finger nails, and kick his feet very rapidly. He was incontinent and vomited

several times. He had a temper tantrum, then soon afterward broke into a smile. On the night after operation, as the nurse prepared to take his temperature, the patient became cyanotic and died within a few minutes. Autopsy permission was refused.

CONVULSIONS

Convulsive attacks are the most embarrassing sequel to prefrontal lobotomy. In most instances they begin from nine to fifteen months after operation but may occur in the immediate postoperative state. Two patients who were subject to attacks before operation had a convulsion soon after the procedure. In one (Case 108) it occurred on the first day and in another (Case 28) on the third day. In two patients (Cases 18 and 189), who gave no history of epilepsy, a convulsion occurred in the hospital. The patient (Case 189) who had a lobotomy in 1943, has had only one attack during the last four years. Of the total number of patients undergoing prefrontal lobotomy, 66, which constitute 12.3 per cent, developed convulsions. Further analysis reveals that 7.2 per cent have attacks after one operation, but 47 per cent develop convulsions after secondary operations. Another factor contributing to convulsions is a complication such as preceding organic brain disease, and operative and postoperative hemorrhage and infection. Ten of the 33 patients with a single operation, who are now subject to attacks, had some such complication.

The attacks usually come on without aura and are generalized, occasionally accompanied by biting of the tongue and relaxation of the sphincters. One patient (Case 125) had a prolonged aura characterized primarily by disorientation. When we are notified of the occurrence of an attack, we advise immediate efforts at control by means of dilantin 0.1 Gm. three times a day and phenobarbital 50 mg. twice a day. If patients cannot tolerate these amounts the dosage is reduced. We try to comfort the relatives (the patient is seldom concerned) by saying that seizures are often followed by improved behavior, and we draw the parallel with electroshock treatment, which so many of these patients have undergone. It is indeed worthy of note that 50 per cent of patients experiencing convulsions after operation have a history of shock therapy before operation.

We are not in a position yet to discuss the effect of the primary radical operation, as compared with the standard approach, upon incidence of convulsions, since the patients have not been observed long enough. Eight out of 40 patients treated by the Moniz operation (used regularly until 1938) had one or more convulsions. Stevens has suggested that the iodized oil may act as an irritating substance, but we have noted convulsive seizures in cases in which no contrast medium has been used.

The incidence of convulsions in our series is higher than that reported by most authors. We believe this is because our cases have been followed for a longer period. In approximately 7 out of 10 cases the convulsions can be brought under control. After a period of two years' freedom from seizures we reduce the dosage of the drugs by half, but advise continuation of some medication for another two years.

Three patients died in status epilepticus (Cases 72, 88, and 150) and one patient (Case 128) succumbed to an epileptic attack while surf bathing.

In most instances seizures have been embarrassing rather than disabling. Some patients after having a series of attacks have gone as long as seven years without a seizure (Case 29). In view of our experience with the high incidence of seizures following secondary operation and operative complications we are now placing all such patients on anticonvulsive therapy.

MORPHINISM

It was not until we began to operate on pain cases that we encountered morphine-withdrawal symptoms. Three patients (Cases 392, 398, and 490) had been on large doses of narcotics, but after prefrontal lobotomy they no longer requested medication, so none was given. A few days after the drug was discontinued, the patients became restless, pulse and respirations rapid, and sweating occurred. Morphine and demerol were stopped the day of operation in a tabetic (Case 392), and although the patient con-

tinued to grimace and to grab his legs when lightning pains occurred, he no longer complained and even denied having pain. On the second postoperative day he looked ill, the temperature jumped from 101.4° F. at 4 P.M. to 106.4° F. at 7:30 P.M., the pulse and respirations were rapid. Since no satisfactory cause could be found for his symptoms, narcotics were resumed. His condition remained critical for four days, but then improved. Narcotics were discontinued again on the ninth postoperative day, with no recurrence of symptoms.

When we operated upon a man with carcinoma of the larynx (Case 490) in April, 1947, we knew that morphine-withdrawal symptoms could occur, so we continued to give him narcotics for the first four days after operation. When we saw him on the ninth day the sheets were wet with perspiration, his pulse and respirations were rapid, and he looked ill and apprehensive. Narcotics were resumed at three-hour intervals and the following day he appeared relaxed, his skin was dry, and the pulse and respirations were almost normal. He lived in comfort for several weeks until he died from carcinoma.

In patients who have been receiving large doses of opiates, it would seem that the combination of postoperative confusion and inertia prevented the patient from appreciating the discomfort due to the withholding of the drug. He was likely, therefore, to experience severe physiologic disturbance. It is well to continue for several days the habitual dose of the narcotic, then gradually to reduce the amount.

INCONTINENCE OF URINE

Urinary incontinence is almost always present after lobotomy. It may be absent or only fleeting if the upper quadrants are spared. Usually it is permanent if incisions are placed in the upper quadrants 15 to 20 mm. posterior to the coronal suture. The control of incontinence is in large measure a matter of regular trips to the toilet, maybe every hour at first, then every two hours and later at longer intervals. Retraining is important, since the patient may be too obtuse or too indolent to attend to his needs.

After lobotomy the bladder seems to have a lowered capacity and a more active stretch reflex. Voluntary control is somewhat impaired, as shown by the inability voluntarily to hold large quantities of urine.

Medical treatment of incontinence is not too satisfactory. Patients dislike atropine in effective doses, they require constant control to prevent them from drinking water when they get thirsty, and salt capsules administered at bedtime rarely are effective. The best treatment, aside from regular trips to the toilet, is ephedrine sulfate 30 to 50 mg. or even more—let us say, up to tolerance. The abnormal response of the bladder to distention (Langworthy, Kolb, and Lewis) may be somewhat reduced and a greater degree of flexibility may be attained.

RETENTION OF URINE

In contrast to the majority of our patients who are incontinent, a few develop urinary retention and require catheterization. One patient (Case 110) cleared up around the tenth day; another (Case 383) continued to have difficulty after going home, and three months later had his prostate removed. Recovery was rapid and complete from both operations.

EXCITEMENT

Just when excitement and resistance becomes a complication depends largely upon the endurance of the special nurse and tolerance of the other patients. During the past 11 years it has been necessary to transfer only seven patients, all men, to a psychiatric hospital on account of disturbing behavior. There have been many times when people have complained about the disturbing behavior of our patients, but by means of persuasion and sedation, electroshock and secondary operations, it has usually been possible to handle the situation. The appearance and behavior of one patient (Case 238) caused him to be transferred before he was even admitted to the hospital. Another patient (Case 50) became so noisy the evening of his operation that we could hear him half a block from the hospital. A recent schizophrenic (Case 499) was not noisy but became so assaultive that all three special nurses resigned and the general duty nurses would

not go into his room. One of our early cases (Case 29) rang the fire alarm and when asked why he did it, he said he was looking at the little red box and the directions said "Pull." After he pulled the lever he realized it was the wrong thing to do. The superintendent of the hospital made it clear to us that his presence was no longer welcome. We had one other patient (Case 257) who rang the fire alarm at the George Washington Hospital, but it occurred at night and instead of considering it a disturbance, the resident surgeon took the occasion to visit every floor and check upon the nurses to see if they were carrying out fire instructions. The resident seemed to enjoy it rather than be annoyed by it.

The other three patients (Cases 259, 220, and 176) were excited catatonics and came out of anesthesia fighting.

EDEMA AND TROPHIC DISTURBANCES

Edema and trophic disturbances of the lower extremities complicating prefrontal lobotomy have been reported by Ziegler and Osgood. In the course of observations in 17 patients they noted bilateral edema in six, and bullae about the heels at points most vulnerable to pressure, in two. Edema occurred in two of our patients (Cases 221 and 219), both of whom had secondary operations. Large bullae measuring 10 to 12 cm. in diameter developed over both heels in Cases 328 and 484. These patients had radical lobotomies, and exhibited marked inertia after operation. The bullae were first noted about a month after operation. Since trophic changes have been brought to our attention, we are careful to get inert patients, in whom certain parts of the body are likely to be subjected to pressure, out of bed as soon as possible. Ziegler and Osgood have suggested that edema and trophic disturbances seem more likely to occur when the surgical incisions are made posterior to the coronal suture, and our cases seem to bear this out.

The fact should not be overlooked that marked edema of the legs, which was present before operation in two of our excited catatonics (Cases 244 and 441), cleared up after radical prefrontal lobotomy.

SUMMARY

Prefrontal lobotomy is a simple but precise operation. As soon as the nurses and anesthetists become accustomed to handling mental patients the operation proceeds quickly and smoothly. It has been necessary to terminate the operation before completion in only 4 cases. We have operated upon 531 patients a total of 610 times with only 12 operative deaths, so the operative mortality is slightly under 2 per cent.

Incontinence and inertia occur in almost every patient and constitute the main nursing problem during the short hospital stay. Fortunately, excitement is rare.

Operative hemorrhage was sufficient to require enlargement of the bony opening to control it in 6 patients. Four developed hemiparesis, which proved to be permanent in two.

Chronic intracerebral hematoma developed in 3 cases and a hygroma in one.

Hemorrhage was the cause of death in one-half of one per cent of the cases.

Convulsions are the most embarrassing sequel to prefrontal lobotomy and occurred in 12.3 per cent of our patients: 7.2 per cent have attacks after a single operation, but 47 per cent develop convulsions after secondary operations. A majority can be brought under control by appropriate medication.

Although the patient does not complain, morphine-withdrawal symptoms may be severe when the drug is withheld following lobotomy.

Theoretical and Clinical Aspects of Vagotomy*

FELIX MANDL, M.D., F.I.C.S.
VIENNA, AUSTRIA

FROM September, 1947, to May, 1948, apart from the usual gastric operations in my department, I performed 101 vagotomies for ulcers of the stomach, pylorus, duodenum, jejunum and anastomotic recurrences after resection. Of these, 69 were ulcers of the pylorus and duodenum and in 13 the operation was combined with gastrojejunostomy.

Vagotomy in cases of ulcer of the stomach has been performed also where conditions such as severe starvation, severe heart and lung disease, and so on, contraindicated extensive resection. In all cases the x-ray findings cleared up after vagotomy. This seems to be characteristic of benign ulcerous lesions.

In one case a mass of lymph nodes in the supraclavicular region was found before operation. The histologic examination revealed an adenocarcinoma. The patient showed a typical x-ray picture of cancer of the stomach with a large defect in the greater curvature. At laparotomy an ulcerating malignant growth was found at this site, penetrating into the spleen. Metastases were present in the liver. Since the patient had had severe pain for months, vagotomy was tried as a palliative measure. It effected relief of pain, and the patient gained weight under a better diet, though the defect shown in the x-ray continued to increase. A colleague of mine (Dr. Steindl) performed vagotomy under the same conditions with the same result. Do these observations justify the conclusion that the vagal fibers contain pathways to the stomach?

Vagotomy has been performed in 6 cases of perforated ulcer. If the patient arrives as much as four to five hours after perforation, our routine procedure is simple occlusion by drain and omentum. In most of these cases a secondary operation on the stomach became necessary after a few weeks, either resection or vagotomy. In the 6 cases vagotomy was attempted at the same time as the occlusion operation. The vagal nerves fortunately could be found easily. The necessity for a second operation is not anticipated.

Some of our cases were complicated by other conditions: severe coronary and heart disease, 4 cases; chronic lung diseases, 3; epilepsy, 1; thyrotoxicosis, 2; megacolon, 1; pregnancy at 3 months, 1. In no case was the complicating condition aggravated by vagotomy, except possibly the case of a patient suffering from duodenal ulcer accompanied by cirrhosis of the liver, in whom the liver condition seemed to be worse after the operation. No complications arose from the vagotomy though theoretically such could be expected.

Of 101 patients operated upon, most of them poor risk cases, only one died on the tenth postoperative day of causes unrelated to the operative procedure. The patient succumbed to acute meningitis subsequent to tonsillar abscess and sinusitis.

No definite results can be given at present. But in a starving population vagotomy seems to have enormous advantages. In the first place, no postoperative regime is necessary, and secondly, there is no need for the routine preparation for a more extensive operation which, in view of the lack of drugs, would in any case be impossible.

All complications were carefully watched. In no case did a complication necessitate a second operation. Gastric and intestinal atony could be controlled with ease. One case of severe cardiospasm with temporary occlusion of the cardia, uninfluenced by papaverine and atropine, was rapidly and permanently relieved by the introduction of a large gastric tube cautiously introduced.

Twenty per cent of our cases sooner or later become diarrheic. This unpleasant complication could be cut short by treatment with opiates, acidol-pepsin, or sulfanilamides. Early cases usually react well to acidol-pepsin medication, but whether this was because or in spite of treatment I am unable

* Read before the Sixth International Assembly of the International College of Surgeons, Rome, May 1948.

to say. The cause of the diarrhea is not yet well understood. Stool examinations give no indication as to how to prevent the complication. All patients have been relieved after some weeks or days; one only after three months.

Electrocardiographic studies (Dr. Eiselsberg) before, between and after operations revealed no changes in cardiac function. Because of lack of other laboratory facilities we examined the diastasis level in the urine and the blood sugar level to observe changes in pancreatic function in 20 cases. In all cases the diastasis rose postoperatively to values on an average of 1:128. The maximum level in one case was 1:512. The highest level was reached on the second and third day after the operation. Two cases remained unchanged. Of the 18 cases, 16 were again normal on the fifth day, 2 on the seventh and ninth days respectively. The blood sugar rose only in 10 of 20 cases. In the 10 cases the rise showed an elevation of blood sugar of 10 to 25 mg. per cent. The highest value could be read on the second and third days. After five days the blood sugar returned to normal. Control examinations after spinal anesthesia in other diseases and operations showed no change of diastasis and blood sugar values postoperatively (Dr. Karnitschnig). The diastasis values after vagotomy appear to be similar to those in pancreatitis. In this connection it is worth-while to remember that sympathetic block in pancreatitis is able to reduce the high diastasis value in pancreatitis in an impressive manner. It is a measure well suited to the quick conservative control of this disease. We have observed six such cases in the past few months. This experience supports present knowledge of the balance between sympathetic and parasympathetic innervation of the pancreas.

All vagotomies were performed by the subdiaphragmatic route which is preferred by Pieri, Dragstedt, Allen, Crile, and Philip Thorek.

In addition to the eight types of distribution of vagal nerves described by Dragstedt, we found a further five types by giving special attention to the posterior trunk. A sixth type, observed in 3 cases, shows a second anterior trunk running in the direction of the porta hepatis. In only 3 of our 101 cases were we unsuccessful in finding the main vagal trunk in spite of opening the hiatus esophagi.

It is well known that the success of the operation depends upon division of all nerves. If this connot be accomplished, resection of the ulcer should be performed at once.

As regards tests, the significance of the Hollaender test is well known. It is my impression that in the near future the validity of the test in relation to the efficacy of vagotomy will give rise to discussion.

On the basis of the balance between the vagal and sympathetic innervation of the stomach I introduced a new and, I hope, valuable test demonstrating that all vagal fibers are cut. The test is based on the findings of Hess and Faltitschek who in 1924 stated that after sympathetic block of the thoracic seventh and eighth on the right side the gastric acidity of the normal person rises and that the motility of the stomach increases. We applied these findings in a practical way in cases of spastic pyloric stenosis in the newborn and in treatment of severe cases of anacid gastritis. On the other hand, the description of Hess and Faltitschek inspired in us the idea that such an increase of the gastric acidity would not occur in cases in which vagotomy has been performed perfectly. This idea could be proved correct in 2 cases. For certain reasons only the left vagus was resected, and the acidity rose after sympathetic block of the thoracic seventh and eighth. In cases in which the anatomic distribution of the infradiaphragmatic fibers was not ascertained with certainty and probably were not completely resected, sympathetic block produced a rise in gastric acidity.

In all cases in which the distribution of the vagal fibers showed a usual type and the resection could be complete, sympathetic block could not produce an elevation of the free and total acidity of the gastric juice. The assumption, then, is that if vagotomy is complete, no rise in gastric acidity will occur after sympathetic block.

The explanation appears to be simple. The blocking of the sympathetic fibers, under nor-

mal conditions, enhances vagal action which augments the motility and acid secretion of the stomach. If the vagal fibers are cut, this function is inoperative, and sympathetic block in the manner expected does not take place.

In 1938 I performed a splanchnicectomy on a patient with essential hypertension. Though the hypertension improved the patient suffered severe gastric pain and finally gastrectomy became necessary for duodenal ulcer which up to that time had been silent. When Ryan and van Hoy in 1946 reported "two deaths after subdiaphragmatic vagotomy" I recalled my own case which I had not understood too well at the time. The first case reported by these authors was one of duodenal ulcer combined with essential hypertension. Vagotomy was performed, followed in 13 days by sympathectomy on the right side. Fifteen days after the second operation the patient died, giving superficial signs of peritonitis. Necropsy revealed perforation of the duodenal ulcer in the peritoneal cavity. The acute pain of the beginning perforation was completely obscured by removal of the sympathetic chain, an operation which, in my opinion, neutralizes the beneficial effect of the vagotomy. The title of the paper had obscured the physiologic facts.

The paper by Blegan and Kintner (1947) had a more accurate title: "Aggravation of Gastric Ulcer following Dorsolumbar Sympathectomy." Two case reports, which need not be quoted extensively, offer convincing evidence that extensive resection of the sympathetic nerve supply to the stomach will have a harmful effect on the clinical course of gastroduodenal ulcer. Here too the operation was performed for hypertension, but following operation such massive hemorrhage occurred that subtotal resection of the stomach had to be performed.

Sicard, Albot and coworkers showed in some cases that although sympathectomy relieves ulcer pain, roentgenographically the ulcer crater shows no evidence of healing.

In the light of these observations the question arises as to whether gastric and duodenal ulcer pain in the future will be treated by sympathetic block and whether such methods should not be rejected.

Vagotomy has brought to light new facts as to the balance between sympathetic and vagal function which will be of value in practical surgery. The value of the operation in itself will be decided in the future. In my opinion this operation, newly revived and animated by Dragstedt, will in time have a solid place in the surgery of peptic ulcer.

Recent and Old Fractures of the Internal Malleolus

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FRACTURES of the internal malleolus may be simple or complex. The simple fracture is without local soft tissue complications. "Complex" is a term recently popularized by Conwell [1] to designate simple fractures that are complicated by blebs, laceration, and excoriation of the skin.

Nearly all fractures of the internal malleolus are associated with fractures of the fibula. Some are complicated by tears or rupture of the tibiofibular ligament. The pathologic degree depends upon the site or location of the fracture and the kind and amount of force that produced the fracture.

This article is concerned only with those fractures in which a reduction is unsuccessfully attempted and those in which conservative treatment is necessarily prolonged because of skin complications. Three varieties of fractures of the internal malleolus will be explained, all of which have a common pathologic entity, namely, a displaced internal malleolus producing a "V" at the fracture site. Usually there are fibers of the transverse ligament stretching like a rubber band between the fragments or tendons to complicate the problem by preventing complete manual reduction. The transverse ligament can be removed only by surgery.

TYPES OF FRACTURES

Type 1. The first type consists of those fresh fractures of the internal malleolus in which the initial reduction under anesthesia proves unsuccessful (Fig. 1). I believe that in this type procrastination is dangerous and multiple attempts at manipulation should not be performed. On the contrary, in these immediate surgery is indicated. An excellent result (Fig. 2) can be obtained by internally fixing the internal malleolus with a metal screw as early as possible. By this procedure the ankle mortise is returned to normal. Excess callus formation is reduced to a minimum and few adhesions and complications are encountered. Following internal fixation plaster splinting for from eight to ten weeks is recommended. Intensive physiotherapy is helpful.

Type 2. The second type comprises those fractures of the internal malleolus complicated by skin conditions such as blebs, laceration, contusion, and excoriation. Immediate reduction is almost impossible but the attempt should be made. In this attempt the surgeon must always be mindful that the patient and the soft tissues must receive primary consideration.

General, not local, anesthesia should be employed. The skin should be cleansed and dressed, and either a plaster mold, or a pillow splint as advocated by Gurd [2] is used for initial immobilization after reduction.

In the case shown in Figure 3, an attempt to reduce the fracture was made under anesthesia after the skin had been cleansed as thoroughly as possible. The foot and leg were immobilized in a plaster splint. Postreduction roentgenograms, however, revealed failure of reduction (Fig. 3). It was necessary to wait seven weeks for the skin to heal completely before an open operation could be performed directly over the internal malleolus. The fragment was everted and held in this position by the transverse ligament. The operative procedure is as follows:

1. All soft tissue is removed.
2. The surfaces are freshened.
3. A small incision is made in the ligamentous attachments of the deltoid ligament at the inferior portion of the internal malleolus to permit the entrance of the drill preparatory to using the screw.
4. A screw is inserted in the drilled hole and the fragment internally fixed to the tibia (Fig. 4).
5. The ligaments are closed and the skin is sutured.
6. A posterior mold cast is applied above the knee which is in 30 degrees flexion. In the case shown in Figure 4 the cast was removed after 12 days.

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Fig. 1. Example of Type 1. Fresh fracture of the internal malleolus. Separation with outward rotation of distal fragment produced a "V" at the fracture site.

Fig. 2. Excellent result obtained by internal fixation with metal screw.

Fig. 3. Type 2, complex type. Example of failure of reduction in fracture of internal malleolus with skin complications.

Fig. 4. Screw inserted in drilled hole for internal fixation of fragment to tibia. Fragment of bone removed from the tibia above the fracture site and inserted into the hiatus or gap at the fracture site.

7. The sutures are removed and a new posterior mold cast is applied above the knee. Now the posterior mold cast is circularized by plaster.

8. In the case illustrated, the second cast was removed after four weeks and another circular cast applied below the knee. The total period of immobilization in this case was four months.

Type 3. The third type, exemplified in Figure 5, is the neglected or unreduced fracture of the internal malleolus. The fracture illustrated was five months old. It had never been completely reduced, and there was nonunion because of soft tissue interposition. There was also absorption at the fracture site. Absorption always adds to the difficulty of reduction and immobilization.

If Type 3 fractures of the internal malleolus do not involve the stabilizing of the ankle mortise, the internal malleolus may be removed and the deltoid ligament sutured to the lower end of the tibia.

The operative procedure previously described is followed as well for the Type 3 fracture; that is, exposing the fracture site; removing all soft tissue from between the fracture surfaces; the use of an osteotome to secure good bone for approximation, and exploration of the ankle joint to remove panus formation and adhesions in order to secure anatomic reduction.

In most cases an osteotomy of the fibula will be required before complete reduction can be obtained. This can be performed through another incision over the fibula, exposing the original fracture site.

FIXATION OF THE INTERNAL MALLEOLUS

When all the fracture surfaces have been exposed and freshened, and when the ankle

has been reduced correctly, the internal malleolus is internally fixed to the tibia by a screw through a hole previously drilled in the internal malleolus. Many times, as in the case shown in Figure 5, there is a gap or hiatus between the distal and proximal

Fig. 5. Type 3. Unreduced fracture of the internal malleolus of five months' duration. Nonunion caused by soft tissue interposition, with absorption at fracture site.

Fig. 6. Postoperative repair.

fragments of the tibia. It is important to remove a fragment of bone from the tibia above the fracture site and insert the removed fragment and cancellous bone (Fig. 4) into the hiatus to promote a bony union and to prevent soft tissue from falling or forming between the fracture ends to cause nonunion. This method has been successful and bony union has occurred in every case treated in this manner.

The period of immobilization is necessarily prolonged because of the type of repair and fracture. Casts are worn for from 12 to 14 weeks. Intensive physical therapy and muscle reeducation are then instituted. .

CONCLUSION

1. In fractures of the internal malleolus it is dangerous to accept as good enough a reduction that is neither adequate nor anatomic. Accurate reduction is important. Failure promotes painful ankles and feet, altered weight-bearing, and arthritic changes.

2. Procrastination in the surgical treatment of fresh fractures in which initial reduction is unsuccessful is ill advised, as the longer surgery is postponed, the more difficult is it to perform and the more uncertain are the end results.

3. Diastasis of the inferior tibiofibular joint should be corrected early, and immobilized long enough so that the scar connective tissue healing is complete. Otherwise, stretching or tearing will occur and favor displacement of the ankle mortise.

RIASSUNTO

1. Nelle fratture del malleolo interno e' pericoloso limitarsi ad una riduzione che non sia ne' anatomica, ne' perfetta. Occorre ottenere una riduzione perfetta: altrimenti permangono dolori a livello della caviglia e del piede, mentre si stabiliscono dei processi artritici.

2. Il procrastinare un intervento operatorio allorquando una frattura recente non e' stata bene ridotta rappresenta un errore, in quanto rende poi piu' difficile l'operazione a compromette il risultato finale.

3. Una diastasi dell'articolazione tibiofibulare inferiore va corretta precocemente ed immobilizzata fino allorquando si e' completata una solida cicatrice fibrosa. Altrimenti puo' stabilirsi una dislocazione dell' articolazione in seguito ad una lacerazione dei tessuti.

SUMARIO

Es peligroso en las fracturas del maleolo interno el acceptar como suficiente la reduccion que ne es adecuada o anatomica. El fracaso en la reduccion favorece el dolor del pie, y hasta el artritismo.

La procrastinacion en el tratamiento quirurjico de las fracturas recientes en las cuales la reduccion no ha sido satisfactoria da mal resultado y hace mas deficil la intervencion en el futuro.

La diastasis de la articulacion tibioperoneal inferior debe de ser corregida tempranamente e inmediatamente se le debe de inmovilizar por suficiente tiempo de lo contrario se favorece el desplazamiento de la articulacion del pie.

RÉSUMÉ

1. Il est dangereux dans les fractures de la malléole interne de se contenter d'une réduction qui n'est ni adéquate ni anatomique. Il importe de faire une réduction complète, car une réduction incomplète entraîne des douleurs de la cheville, du pied, interfèrent avec le support du corps et engendrent des troubles arthritiques.

2. Il ne faut pas retarder le traitement chirurgical des fractures récentes dans lesquelles la réduction initiale n'a pas été achevée. Il sera plus difficile d'obtenir de bons résultats si on retarde l'intervention opératoire.

3. La diastase de la jointure inférieure tibiofibulaire doit être corrigée. Le membre doit être immobilisé assez longtemps pour que l'union du tissu, cicatriciel et conjonctif soit obtenu ; autrement, l'étirement ou la dechirure surviendront et favoriseront le déplacement de la mortaise de la cheville.

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Anterior Capsulectomy for Contractures of the Elbow*

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AN operation is being presented for the reconstruction of the elbow in which there is limitation of motion due to contracture of the anterior portion of the capsule. The results are good enough to warrant performance of this operation before undertaking more extensive procedures.

The improvement which may be expected is an increase in motion, mainly extension, of 25 to 45 degrees. The motions of the elbow joint necessary for adequate function are AGF-70 degrees to AGE-130 degrees.

Capsulectomy for the treatment of flexion deformity of the elbow has been described by Dr. Philip D. Wilson.[1]

In the present series, 8 of the cases were soldiers injured in combat by penetrating bullet or shrapnel, and 2 were adolescent patients in one of whom there was a malunited fracture of the elbow joint, and in the other a deformity following an operation for open reduction of an unreduced dislocation.

Surgery was performed only when all attempts at conservative therapy had failed. This consisted of plaster immobilization and supervised physical and occupational therapy.

The pathology of this deformity is an adhesive capsulitis of the elbow, a contracted anterior capsule, together with periarticular fibrosis. Therefore, it appears that improvement can be expected by excision of the periarticular fibrous adhesions and removal of all fibrotic portions of the capsular ligament of the joint. In practically all of the cases it was necessary to remove the entire anterior capsule.

The results to be expected from this surgical approach and technic are increased range of extension, increased range of flexion, maintenance of joint stability, and elimination of the possibility of surgical trauma to nerves whose anatomic positions have been altered by loss of or damage to the soft tissues.

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1. J. Bone and Joint Surg., Jan., 1944.

ANATOMY

The elbow joint is a modified ginglymus joint. It is surrounded by ligaments so blended as to form a capsule which normally presents localized thickening in the form of bands. The anterior ligaments, attached above to the upper margins of the coronoid and radial fossa of the humerus and below to the coronoid process of the ulna and orbicular ligaments, present a well-marked, superficial band of obliquely directed fibers passing over the joint from the inner condyle of the humerus to the orbicular ligament. The internal lateral ligament, consisting of three diverging fasciculi, is attached at its apex to the inner epicondyle, the posterior band passing to the upper part of the coronoid process, the anterior to the inner side of the coronoid process, and the middle deeper band to the inner margin of the greater sigmoid cavity. The external lateral ligament is attached above to the external epicondyle and below to the ulna and orbicular ligament. The posterior ligament is attached above to the upper and lateral margins of the olecranon fossa and below to the olecranon process.

SURGICAL TECHNIC

A blood pressure cuff tourniquet inflated to 200 mm. Hg is used. A longitudinal incision, running proximal to the inner condyle of the humerus, is carried distally for approximately 2 inches. The ulnar nerve is identified and retracted. The inner epicondyle of the humerus is cut through with an osteotome and retracted, along with the origin of the flexor muscles. Careful elevation of the anterior structures then permits visualization of the medial aspect of the elbow joint. The medial half of the scarred, thickened anterior capsule is elevated by means of a periosteal elevator and dissected free from its bony attachments above and below. This is then excised. Periarticular adhesions are removed. The internal epicondyle is replaced and held in place by chromic catgut.

A second incision is made on the lateral side of the elbow, proximal to the lateral condyle of the humerus and carried distally, approximately 2 inches, to the head of the radius. By careful elevation of the anterior structures, the lateral aspect of the elbow is visualized. The lateral half of the anterior capsule is removed by the same procedure as utilized on the medial half. The incisions are closed with interrupted cotton sutures. A compression dressing is applied consisting of sterile mechanics waste and an Ace bandage. The tourniquet is then released.

AFTER-TREATMENT

The compression dressing is not disturbed for three days, at which time it is removed. Active exercises are started four days postoperatively. On the seventh day, the sutures are removed and the active exercises are augmented with physical and occupational therapy.

The patient is encouraged to carry on active exercises but passive motions are not permitted. The carrying of heavy weights, hanging on a trapeze, and other forcible stretchings are forbidden. Occupational and physical therapy technics that stimulate normal function are encouraged. These are: weaving, printing, bookbinding, carpentry work, basketball, baseball, and calisthenics, together with many other sports and activities.

CASE REPORTS

Case 1. J. B. G., age 19, was wounded in action Aug. 10, 1944. Bullet entrance was on the dorsal, the exit on the volar aspect of the elbow joint. Immobilized in plaster to Sept. 21, 1944. Five months of physical and occupational therapy followed with no increase of motion.

Preoperative motion: AGF 90 degrees to AGE 105 degrees.

Postoperative motion: On table—AGF 60 degrees to AGE 150 degrees. Two months later—AGF 90 degrees to AGE 145 degrees. Improvement: 40 degrees in extension.

Case 2. W. L. S., age 22, was wounded in action Nov. 22, 1944. Shell fragment to left elbow. Immobilized in plaster to Jan. 2, 1945. Ten weeks of physical and occupational therapy resulted in 5 degrees increase in flexion and 5 degrees increase in extension.

Preoperative motion: AGF 85 degrees to AGE 100 degrees.

Postoperative motion: On table—AGF 55 degrees to AGE 165 degrees. Three months later—AGF 80 degrees to AGE 125 degrees. Improvement: 25 degrees in extension and 5 degrees in flexion.

Case 3. V. A., age 31, wounded in action Aug. 31, 1944. Bullet injury producing fracture compound comminuted complete humerus lower third. Immobilized in plaster to Nov. 12, 1944. Three months of physical and occupational therapy resulted in 10 degrees increase in flexion and 5 degrees increase in extension.

Preoperative motion: AGF 70 degrees to AGE 100 degrees.

Postoperative motion: On table—not recorded. One month later—AGF 70 degrees to AGE 128 degrees. Improvement: 28 degrees in extension.

Case 4. E. Z., age 19, wounded in action April 23, 1944. Penetrating shrapnel wound of left elbow with compound comminuted fracture distal third of left humerus. On May 7, 1944, open reduction and fixation of fracture. Eight months of physical and occupational therapy with no increase of function.

Preoperative motion: AGF 80 degrees to AGE 130 degrees.

Postoperative motion: On table—AGF 60 degrees to AGE 130 degrees. One month later—AGF 80 degrees to AGE 130 degrees. Improvement: None.

Case 5. T. H., age 20, fell from cargo net while going over obstacle course on Oct. 16, 1943. Sustained dislocation, compound, complete ulna and radius of left elbow and fracture compound comminuted of left coronoid process. Eleven months of physical and occupational therapy resulted in 5 degrees of improvement in extension.

Preoperative motion: AGF 60 degrees to AGE 105 degrees.

Postoperative motion: On table—AGF 45 degrees to AGE 160 degrees. Five months later—AGF 45 degrees to AGE 130 degrees. Improvement: 25 degrees in extension and 15 degrees in flexion.

Case 6. J. L., age 22, sustained compound comminuted supracondylar fracture right humerus. Treated by plaster immobilization plus skeletal traction. Three months later, cast and traction removed and physical and occupational therapy started. Three and a half months later, no increase of motion.

Preoperative motion: AGF 85 degrees to AGE 100 degrees.

Postoperative motion: On table—AGF 70 degrees to 160 degrees. Four months later—AGF 70 degrees to AGE 130 degrees. Improvement: 30 degrees in extension and 15 degrees in flexion.

Case 7. J. F., age 32, wounded in action June 15, 1944. Penetrating wound of right elbow with compound comminuted fracture of lateral condyle of right humerus. Immobilized in plaster for two months. Seven months of physical and occupational therapy with no increase in motion.

Preoperative motion: AGF 80 degrees to AGE 90 degrees.

Postoperative motion: On table—AGF 57 degrees to AGE 140 degrees. Two months later—AGF 57 degrees to AGE 105 degrees. Improvement: 15 degrees in extension and 23 degrees in flexion.

Case 8. A. M., age 25, wounded in action Dec. 6, 1944. Compound comminuted fracture of distal third of left humerus caused by shell fragments. Immobilized for two months in plaster. Four months of physical and occupational therapy with no increase in motion.

Preoperative motion: AGF 55 degrees to AGE 155 degrees.

Postoperative motion: On table—AGF 50 degrees to AGE 170 degrees. Three months later—AGF 55 degrees to AGE 140 degrees. Improvement: 25 degrees in extension.

Case 9. A. S., age 11, fell off coal bin in July, 1945, and sustained a fracture of external condyle of humerus. Was admitted to the Monmouth Memorial Hospital, Long Branch, New Jersey, for open reduction followed by physical and occupational therapy for one year without improvement.

Preoperative motion: AGF 95 degrees to AGE 155 degrees.

Postoperative motion: On table—AGF 55 degrees to AGE 175 degrees. Four months later—AGF 80 degrees to AGE 170 degrees. Improvement: 15 degrees in extension and 15 degrees in flexion.

Case 10. G. L., age 14, suffered fracture dislocation of right elbow Oct. 1, 1945. Was admitted to the Monmouth Memorial Hospital, Long Branch, N. J., for open reduction, followed by eight months of physical and occupational therapy with improvement during only the first four months of treatment.

Preoperative motion: AGF 90 degrees to AGE 120 degrees.

Postoperative motion: On table—AGF 40 degrees to AGE 180 degrees. Two months later—AGF 80 degrees to AGE 145 degrees. Improvement: 25 degrees in extension and 10 degrees in flexion.

It is realized that all of the pathology in flexion contractures of the elbow is not necessarily in the anterior portion of the capsule. In severe injuries about the elbow joint, there is a loss of muscle length or substance in the biceps and brachioradialis. These structures were not attacked operatively because it is felt that a biceps tendon lengthening or brachioradialis stripping would require too lengthy immobilization if maximum range of motion is to be obtained.

SUMMARY

1. An operation has been presented which will improve the range of motion, particularly in extension, where there is a flexion contracture.
2. All cases presented had received physical and occupational therapy, without improvement, for months before surgery was performed.
3. No complications, either vascular or neurologic, have been encountered after this operation.
4. All cases, with a single exception, have been improved by the operation and aftercare.
5. The follow-ups on these cases have been of short duration.
6. No immobilization is used.
7. Active motion within the tolerance of pain is started as soon as possible.
8. There has been an average improvement of from 30 to 45 degrees in motion, approximately 10 degrees of flexion and 25 degrees of extension.
9. It is felt that the average improvement warrants the recommendation of this procedure.

RIASSUNTO

Descrive un nuovo metodo operatorio onde accrescere—nei casi di contratture in flessione—l'ampiezza dei movimenti, specialmente di estensione. In tutti i casi operati la terapia fisica ed occupazionale era stata inutilmente tentata per mesi e mesi. All'operazione non sono seguite complicazioni vascolari o nervose.

In un solo caso e' mancato un miglioramento. I movimenti attivi debbono essere iniziati al piu' presto dopo l'intervento, naturalmente nei limiti della dolorabilita'. L'ampiezza dei movimenti viene cresciuta, in media, di 30°–45°: approssimativamente di 10° nella flessione, di 25° nell'estensione.

Questi risultati giustificano l'adozione del nuovo metodo operatorio.

SUMARIO

Se describe una tecnica operatoria en el tratamiento de las contracturas en flexion que facilita el mayor movimiento especialmente en la extension. Todos las casos que se han presentado fueron tratados previamente con la fisioterapia y occupacionalmente por varios meses antes pero sin resultados favorables. Ningun caso operado por esta tecnica han presentado complicaciones vasculares o neurologicas. Todos los caso con una sola excepcion obtuvieron cirte mejoria. Post operatoriamente se estimulan los movimientos activos hasta el limete de tolerancia del paciente al dolor. La mejoria presenta un averaje de 30 a 45 grados en la mocion, 10 grados en la flexion y 25 grados en la extension; lo cual justifica el uso de esta tecnica.

RÉSUMÉ

Une operation a été presentée qui améliore l'étendue du mouvement, surtout l'extension quand il existe une contracture de la flexion. Tous les cas presentés avaient été soumis à un traitement physique et occupationnel pendant des mois et aucune amelioration n'avait été obtenu amelioration avant qu'on intervienne chirurgicalement. Après l'opération ainsi recommendée, il n'y eux aucune complication vasculaire ou neurologique. Tous les cas sans exception bénéficièrent de l'opération et des soins postopératoires. On n'a pas suivi ces cas pour une longue durée. On n'eut pas recours à l'immobilisation. On commenca aussitôt que possible les mouvements actifs limites seulement par la tolérance du malade à la douleur. On a obtenu en moyenne une amélioration de 30 a 45 degrès en mouvement, approximativement 10 degrès en flexion et 25 degrès en extension. Le resultats justifient l'emploi de cette méthode.

Infections of the Extremities

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INTRODUCTION

ADAMI [1] characterized inflammation as the reaction of irritated or damaged tissues which still retain vitality—essentially a process of adaptation of the organism. It consists of a series of local changes manifesting the attempt at repair of actual or referred injury to a part. Cohnheim [2] considered inflammation to be a process reducing the harmful consequences of injury, and Opie [3] defined inflammation as a method by means of which cells and serum accumulate about an injurious substance to remove or destroy it. Excellent descriptions of the inflammatory process have been recorded (Borst [4]; Brücke [5]), and each observer has attempted to rationalize the clinical and microscopic appearance of the inflamed tissues on the basis of the underlying histology. Virchow emphasized that the increased metabolism of the inflamed area paralleled the increased nutritive demands of the involved tissues.

William Harvey [6] noted the many circumstances which altered the blood flow, and explained the inflammatory process primarily as a result of capillary dilation. Using a plethysmograph with photographic recording, Burton [7] showed that from full constriction to full dilation there was an increase in blood capillary flow from 5 cc. per minute per 100 Gm. of tissue to 50 cc. per minute per 100 Gm. of tissue.

Although Bayliss [8] and Gaskell [9] had shown that carbon dioxide is a capillary dilator, Findlay [10] stated that histaminelike substances liberated at the point of injury effected a local dilation of the small vessels and arterioles and an increased permeability of the vessel walls. The same conception has been held by others (Loos [11], Moon [12], Ebbecke [13], Dale and his colleagues [14], Atzler and Lehmann [15], Grant [16], Barcroft *et al.*[17]). Harris [18] showed that vasodilation in the submaxillary gland may be produced by the collection of metabolites and that the production of osmotically active substances greatly increases filtration.

Although Ricker and Regendanz [19] had maintained that the capillaries in inflammation are not more permeable than normal and that the composition of the edema fluid could be explained by increased intracapillary pressure, other observers insist that the capillaries are rendered highly permeable during inflammation (Török, Lehner, and Kenedy [20]; Adlersberg and Perutz [21]). Some investigators have explained the apparent increased permeability as being due to capillary stasis (Florey [22]; Gelpke [23]) and opening of arteriovenous anastomoses (Gerard [24]; Clark and Clark [25]; Popoff [26]), with establishment of a greater capillary bed (Martin, Woolley, and Miller [27]).

The papers of Sir Thomas Lewis and Grant [28] record their experiments upon capillary reactivity, particularly in regard to wheal formation. In the words of Lewis, "... there exists in the skin a single and organized mechanism of defense against injury of all kinds and ... the agent which alarms the garrison and mobilizes the first forces of this defense is a chemical agent derived from the tissues ... being independent of higher centers of organization (nervous) and of distribution (vascular)."

DIAPEDESIS

With the dilation of capillaries in the inflammatory field and the subsequent slowing of the stream, margination and emigration are coincident phenomena. Arnold [29] insisted that diapedesis took place through preformed stomata in the capillary wall. The French school strongly believed that diapedesis was an active process induced by contact of the capillary wall with bacteria or their products (Bouchard [30]; Charrin and Gamaleia [31]; Dutrochet [32]). Fischer [33] led a group which held that capillary stomata do not exist. He showed that erythrocytes could pass through

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gelatin by gravity or pressure without leaving apertures or other traces, just as mercury will pass through solidified gelatin.

Although it had been known that dead or living bacteria or their products were strongly chemotactic (Gabritchevsky [34]; Massart and Bordet [35]; McCutcheon, Dixon, Mudd, and Lucké [36]), it was not until the studies of Falk and his coworkers [37] that the electrophoretic potentials of bacteria and leukocytes were quantitated.

Abramson [38] was the first to quantitate the intimate relationships between the electrostatic charges on the blood cell surfaces and that on the capillary walls. His brilliant papers on the alteration of electrostatic charge induced by inflammation should be reviewed by every student of the subject. Briefly (Bellis and Scott [39]), it appears that, under normal conditions, blood cells and capillary membranes possess a negative charge (thermodynamic and electrokinetic potentials). In inflammation, the potential on the capillary wall is reduced, causing attraction of leukocytes (margination); diapedesis results from the increased potential difference between the colloidal micelles in the tissue spaces and the leukocytes. Both the thermodynamic and electrokinetic potentials on the leukocyte are greater than on the erythrocyte because of the greater size of the leukocyte; hence, a much greater reduction of potential on the capillary wall is necessary to produce margination and migration of erythrocytes. In severe inflammations even this takes place. The studies by Knisely and his colleagues [40] suggests that the sludging of blood is related directly to these surface phenomena.

PERMEABILITY OF CAPILLARIES TO PROTEIN

Although normally the glomerular ultrafiltrate is protein-free (Wearn and Richards [41]), the capillary wall in other parts of the body is permeable to protein (Drinker and Field [42] Cavett [43]; Conklin [44]; Magnus [45]; Erlanger [46]; Churchill, Hakazawa, and Drinker [47]; Peters [48]; Scott [49]; Bayliss *et al.*[8]; Böhm [50]).

Lymph formation and the character of exudates have been submitted to extensive investigation, and Meyer [51] has discussed adequately the origin and removal of edema fluid. Generally, it is conceded that subcutaneous lymph and plasma are nearly identical in chemical composition except for the concentration of proteins and substances (phosphorus and calcium) combined with protein (Heim [52]; Underhill *et al.*[53]; Drinker and Field[42]). Subcutaneous lymph in the human has been found to contain as high as 3.5 per cent protein (Munk and Rosenstein [54]), the albumin-globulin ratio being the same as that in the corresponding blood plasma.

The fibrinogen content of blood plasma in acute infections is increased markedly (Ruszniyak, Barat, and Kurthy [55]; Starlinger [56]; Senator [57]), and this may account for the gelatinous matrix of the inflammatory field (Baitsell [58]). This exudate, when rendered cell-free, is far more bactericidal than is the blood serum of the same animal, but it appears that the leukocyte products are largely responsible for this activity (Buchner [59]; Denys and Havet [60]).

REGIONAL LYMPH FLOW

In the horse, a volume of lymph equal to that of the blood may be obtained in 24 hours (Delamere [61]). Starling [62] showed that in order to get any lymph at all for study in the normal animal, one must knead or passively move the limb. This maneuver probably increases the protein content so that "normal" figures are inaccurate. In edematous tissues, however, the connective tissue tends to keep the lymphatics open so that a greater lymph flow occurs, the oncotic pressure of the blood opposing the capillary filtration pressure. Exercise, heat, and inflammation increase the lymph flow and pressure (McMaster *et al.*[63]); in fact, in the presence of mild inflammation, lymphatics will permit the diffusion of otherwise indiffusible dyes through their walls.

From the clinical standpoint it is interesting that Parsons and McMaster [63] discovered that pulsatile perfusion of blood vessels in the rabbit ear increased the rapidity of lymph flow 15 to 20 times that observed when constant blood pressure was applied, despite the fact that in many instances less blood flow per gram of ear occurred. Edema sometimes de-

veloped during the course of a pulsatile transfusion, concurrent with an enormous increase of lymph flow, although the volume of blood perfused was relatively small.

Although antibiotics and sulfones are important in the stemming of spreading infection, there has yet appeared no immunologic agent to unburden the surgeon of his struggle with this type of condition. As Wangensteen [64] has pointed out, the surgeon has learned that incision of extending areas of phlegmon and cellulitis does not stem the spread of infection—that, in fact, such procedures do harm. Whether such an infection be in the soft tissues of the arm, leg, brain, or lung, the surgeon must restrain himself and support the natural defenses of the body, withholding actual surgical intervention until signs of localized suppuration are evident. Only then should drainage be established.

Formerly, therapy was directed at reduction of the effects of inflammation, but more recently it has been suggested that the accompanying swelling was useful and assisted in localizing the infection, diminishing the tendency to centripetal spread. Mindful of this, Bier [65] sought to increase the heat and swelling attending infection by application of heat, by obstructing the venous return, and by cupping. Noetzel [66] believed that a current of tissue fluid was established by Bier's hyperemia, the fresh transudate being bactericidal and the hyperemia stimulating fibrosis. Undoubtedly, the inflammatory exudate possesses immunologic properties; yet the impression can not be avoided that tense edema is harmful.

POSITION AND VOLUME CHANGES IN THE HUMAN

Quiet standing leads to hemoconcentration, characterized by increase in the specific gravity of the blood and plasma and decrease in circulating blood volume (Böhme [67]; Harrop and Waterfield [68]; Thompson, Thompson, and Daily [69]; Youmans *et al.*[70]). Venous congestion has been shown to have a similar effect (Yamaguchi [71]; Stewart [72]; Rowe [73]; Plass and Rourke [74]; Reiss [75]). Piorry [76], who described the influence of gravity as an impediment to circulation in the standing position, was the first to demonstrate that the venous and capillary circulation is influenced by position, that it is gravity that causes veins to swell when the arm is dependent, and that gravity is responsible for hypostatic pneumonia.

It is not surprising, therefore, that attention has been directed by many observers to the increase in volume of an extremity when it is dependent or when the venous return is partly or entirely occluded (Atzler and Herbst [15]; Stead and Kunkel [77]; Hamilton, Lichty, and Pitts [78]; Wells *et al.*[79]; Waterfield [80]; Bolton [81]; Mende [82]; White and Jones [83]; Drury and Jones [84]). Mosso, using a delicate balance board, found that when a subject assumed the horizontal position after standing for some time, the weight of the feet end of the board only slowly decreased, in spite of the fact that the excess blood leaves the lower extremities almost immediately.

CAPILLARY BLOOD PRESSURE

Any study of inflammation must, of necessity, consider the vacillating capillary pressure, the determination of which is delicate work. Capillaries in the living individual have been described adequately by many observers (Boas [85]; Abderhalden [86]; Redisch [87]; Bardley, Graw and Sherman [88]; Thaller and Draga [89]; Stegemann [90]; Schur [91]; Sehrt [92]; Parrisius and Winterlin [93]; Roy [94]; Niekau [95]; Neumann [96]; Magnus [97]; Weiss [98]; Elliott [99]; Grosser [100]; Heimberger [101]; Sheard [102]; Florey [22]; Herzog [103]; Popoff [26]), but the determination of their intraluminal pressures has defied investigators until quite recently. The blanching pressure (von Recklinghausen [104]; van der Spek [105]; Carrier and Rehberg [106]) and the pressure required to stop bleeding (Basler [107]) are inaccurate methods since occasionally they give values lower than venous pressure in the same individual (White [108]). The figures so obtained are probably the pressures required to empty the subpapillary venous plexuses (Danzer and Hooker [109]). The pressure necessary to prevent wheal formation (Adlersberg and Perutz) also gives an abnormal reading. The slightest variations in the surroundings may lead to remarkable changes in the diameter of a capillary and in its pressure (Briscoe [110];

Ellis and Weiss [111]; Ershler [112]); in fact, capillary pressures ranging from 1.5 to 71 mm. Hg have been recorded as normal (Strax and de Graff [113]). Using the method of Lombard [114] and of Landis [115], micropipets can be drawn from fine glass tubes and capillary cannulation accomplished with the Chambers micromanipulator [116].

PHYSICAL FACTORS IN INFLAMMATION

It has been shown (Bellis [39]) that, with the upper extremity in the horizontal position, the radial systolic blood pressure is about 30 mm. Hg higher than in the elevated position and, with the extremity dependent, about 45 mm. Hg higher than in the elevated position. There is an increase of 15 to 20 mm. Hg when the extremity is brought from the horizontal to the dependent position. Concomitantly, it can be shown that, after elevating the upper extremity perpendicular to the horizontal trunk for an hour, the skin surface temperature of the fingertip becomes 4° or 5° C. lower than when in the horizontal position. A similar decrease in temperature can be demonstrated after elevation of the lower extremity at 60° with the horizontal. On the other hand, after 12 hours in the semi-Fowler position, the skin surface temperature of the lower extremity increases 3° or 4° C.

In normal patients, the subcutaneous tissue tension on the dorsum of the hand averages about 2 mm. Hg. The subcutaneous tissue tensions found in inflammations are always higher than normal, the distensibility of the tissues tending to limit capillary filtration (Beecher [117]). In the region of acute fractures, the tissue pressures range from 8 to 16 mm. Hg. After immobilization, the tissue pressures drop remarkably. A similar increase of tissue pressure may be demonstrated in miscellaneous types of inflammation.

During the day there is an increase in volume of the lower extremity of from 500 to 800 cc. (Bellis [39]). Expressed as increase per 100 cc. of extremity, the increases have been found to range from 0.5 cc. per 100 cc. of extremity to 7.3 cc. per 100 cc. of extremity. These increases amount to from 2 to 7 per cent of the leg volume. In infections of the lower extremity, an increase of 4500 cc. in volume has been observed over that in the corresponding normal extremity. After elevation of the infected extremity, the volume rapidly diminishes, the most rapid decrease occurring in the first few hours.

In inflammations of human upper or lower extremities, the skin surface temperatures may increase as much as 7° C. At the same time, the specific gravity of the edema fluid ranges from 1.019 to 1.030, corresponding to protein contents of 4.1 to 7.9 per cent. In experimental inflammations in cats and rabbits, it has been shown that the protein in the vesicle fluid may be 4 to 6 per cent, approximating plasma protein levels (Drinker and Field [42]). In these areas, the subcutaneous tissue tension may be elevated to 28 mm. Hg, the control tissue tensions being 0 to 2 mm. Hg. The capillary pressures rise from a control of 22 mm. Hg to 40 mm. Hg in the inflamed areas. Increases of extremity volume as great as 65 cc. have been observed in these small animals.

CLINICAL APPLICATIONS

Hilton [118] wrote a fascinating and informative treatise on rest and pain in which he stressed the importance of rest in the treatment of infections. Those skilled in the treatment of tuberculosis will attest to this fact. A short time later, Dennis [119] pointed out the value of immobilization in plaster in the treatment of compound fractures, and Orr [120] adopted rigid immobilization in plaster as a sequel to sequestrectomy for chronic osteomyelitis, shortly thereafter employing closed plaster encasements and massive vaseline packs after extensive osteotomy in acute osteomyelitis.

The essential treatment of acute infections of the extremities should be (a) rest by rigid immobilization of the extremity (if necessary, a plaster encasement, including the trunk, may be employed), and (b) elevation of the affected member in such a manner as most rapidly to drain the edema fluid toward the heart by gravity. If a plaster encasement is used, appropriate openings should be made to permit frequent observation of the infected area. When there is evidence of suppuration, a small incision is made for evacuation of the

exudate through the window. Large incisions have no advantage, producing only more trauma to tax the patient's already burdened healing powers.

The only type of case in which early incision is warranted is acute tenosynovitis. In such cases, the necessity of early opening of the tendon sheath to preserve the nutrition and identity of the tendon has been pointed out by Kanavel.[121] For a similar, but not identical reason, opening of an anterior closed space infection is necessary *before* suppuration occurs.

The immobilization which can be secured by a plaster encasement is more efficient than that obtained by any other method. Sandbags, traction, voluntary rest, and other measures do not offer the relaxation and rest to an inflamed extremity rendered by an adequate plaster encasement. At the University of Minnesota Hospital, in the treatment of infections of extremities in 116 patients, good results (rapid control of the infection with healing) were obtained in 72.2 per cent; fair results (control of the infection with delay or recurrence) were obtained in 21.6 per cent; poor results (uncontrolled infections) were seen in 6.0 per cent.

INFLAMMATION AND PAIN

Inflammation is in large part a reflex act initiated by pain (Odermatt[122]; Rosenbach[123]; Ricker and Regendanz[19]). Spiess[124] emphasized that anesthetized wounds underwent less inflammation, and that a direct relationship existed between anesthesia and healing. He noted that the more painful a wound the more it became inflamed. If the pain was removed by means of a local anesthetic, the inflammation diminished to an extraordinary degree. Thus, he advocated the use of local anesthetics to abolish or reduce inflammation in the eye, nose, and throat, a teaching which is followed today.

Bruce[125] showed that conjunctival anesthetics prevented experimental inflammation, that the initial vasodilation in inflammation is an axon reflex, and that the development of edema is dependent upon the integrity of the axon reflex. In his experiments, he used alypin, a local anesthetic, to prevent mustard oil inflammation in the eye. Bardy[126] advocated the use of morphine to reduce inflammation and stated that "dolor" was responsible for "turgor," "rubor," and "calor."

INFLAMMATION AND REST

Beecher[117] demonstrated the marked lymph flow attending muscular activity. Since the lymphatic channels through which infection spreads lie in the fascias between the muscles, decrease of muscle movement by immobilization serves to minimize dissipation of the infection, and is an important factor in aiding the natural defenses of the body in localizing the infection.

Adler and Meltzer[127], speaking of tissue fluid, wrote, "The fluid spreads with more or less ease from one lymph space to another, the propelling forces being diffusion and mechanical pressure. The latter is caused, first, by contracting the muscles surrounding the lymph spaces, and, second, by gravity and external mechanical pressure (massage)." The excellent work of McMaster, Hudack, and Parsons[63] illustrates the readiness with which the gentlest massage increases lymph flow.

The harmful effects of heat in the presence of inflammation has been emphasized by Allen[128] and by Samuel[129]. It is well known that heat increases formation of tissue fluid (Freeman[130]; Amitin[131]; Drury and Jones[84]; Castellani[132]; Hewlett and van Zwaluwenburg[133]). Owing to local vasodilation, much more heat than in a homologous normal area is present in an inflamed area, resulting in an excess production of edema fluid. Heat promotes filtration through the capillary wall. This produces an increase of tissue pressure which compresses venules and elevates venous pressure. Simultaneously, capillary pressure is increased, the filtration of fluid through the capillary walls into the tissue space of an inflamed area being a product of the increased intracapillary pressure and the increased permeability of the capillary wall due to the inflammation and the heat. The tissue pressure opposes this filtration. It is doubtful if heat is a therapeutic adjuvant in the treatment of inflammation. If any therapeutic temperature change would be desired, the

application of cold may be better, although heat is analgesic.

EFFECT OF ELEVATION

Elevation of an inflamed part diminishes the edema and venous pressure and reduces its temperature. Because the capillary wall is much more permeable to protein, which escapes into the tissue spaces, edema can be removed only partly by elevation. Since a diminished transudation of fluid is effected by elevation and by the introduction of the effect of gravity on blood flow and on the edema already formed, elevation definitely reduces the tissue tension and volume of the extremity. Friedrich [134] taught that the rising tissue pressure compressed capillaries and caused gangrene.

Thus, the sitting or standing position is indicated for infections of the head and neck, and the Trendelenburg position for pararectal, scrotal, pelvic, and lower abdominal inflammations. Carrier and Rehberg showed that when the hand is above the heart, capillary pressure is low, and when dropped below, the increase of capillary pressure is almost identical with the theoretic increment due to the hydrostatic pressure of the column of the venous blood. Koch [135] and Mason [136] have advocated compression dressing of the elevated inflamed hand to secure pressure on veins.

RELATION BETWEEN CAPILLARY PRESSURE, PLASMA ONCOTIC PRESSURE, TISSUE TENSION, AND TISSUE ONCOTIC PRESSURE

Graham,[137] who first used the term colloid, mentioned that plasma colloids might exert an osmotic pressure in the blood. After Starling's demonstration of the colloid osmotic pressure developed by the plasma proteins, Schade and his coworkers [138] showed that, in inflammation, especially in suppuration, the osmotic pressure of the tissue fluid may be as high as 11 atmospheres. They believed, therefore, that inflammatory edema was nearly entirely an osmotic phenomenon, but gave proper importance to the tissue tension. Burch and Sodeman [139], however, showed that the tension in developing edema was unusually high due to the "tone" of the connective tissue. Landis has shown that the blood pressure at the arteriolar end of the capillary loop is about 45 cm. water, that the pressure at the venous end is 22 cm. water, and that the colloid osmotic pressure of the blood is 35 cm. water. Thus, there is a tendency for ultrafiltration at the arterial end and to resorption of fluid at the venous end of the loop.

That this ideal system operates only under "normal" conditions is well accepted (Youmans [70]; Smirk [140]; Fahr [141]; Krogh, Landis and Turner [142]; Field and Drinker [42]). In inflammation or venous engorgement, there is outpouring of filtrate into the tissue spaces. Some investigators have even assumed that a linear relationship exists between the rate of edema formation and the difference between capillary pressure and the osmotic pressure of the plasma proteins (Moore [143]; Weech, Goettsch, and Reeves [144]; Bazett [145]).

The factors influencing the local formation of edema have been subjected to rigid investigations by competent observers, and it appears that the primary factors are (1) elevated capillary pressure, (2) lowered colloid osmotic pressure of the blood plasma, (3) damage to the capillary wall, and (4) lymphatic obstruction. Contributory factors are (5) low tissue pressure, and (6) warmth. Krogh laid great stress on the intracapillary pressure, while Schade believed that the two most important balancing factors are the tissue tension ("Gewebsspannung") and the imbibition pressure of the interstitial colloids ("extracelluläre wasserdurchtränkte Bindegewebskolloid").

The high protein levels of inflammatory edema fluid may be equivalent to a colloid osmotic pressure of 40 cm. water (von Farkas [146]; Govaerts [147]). Therefore, the tissue fluid may raise the osmotic pressure on the outside of the capillary to such a level that resorption of fluid by the capillary through osmotic means may be slowed greatly or become impossible.

Fahr stated that the sum of serum protein osmotic pressure and tissue tension need not equal the sum of edema fluid osmotic pressure and intracapillary pressure except during

equilibrium. If fluid is leaving the capillary, the hydrostatic capillary pressure will be so high that the sum of capillary pressure and edema fluid osmotic pressure will be greater than the sum of the forces retaining fluid in the capillary.

As an example, the following equilibrium, in terms of millimeters of mercury, was found to be established in experimental inflammation:[42]

(a) pulling into blood:
18 mm. Hg (6% plasma protein) + 31 mm. Hg (tissue pressure) = 49 mm. Hg

(b) pulling into tissues:
12 mm. Hg (4% edema fluid protein) + 40 mm. Hg. (capillary pressure) = 52 mm. Hg

It has been observed clinically that elevation, rigid immobilization, and avoidance of heat accelerate the healing of infection and are accompanied by striking relief of pain. In the last few years, therefore, immobilization and elevation of infected extremities have been employed as the primary treatment in a number of acute phlegmonous infections, among which have been cases of infection of joints, bones, and soft tissues. The impression has been gained that this method of treating joint infections, when accompanied by proper incision to afford dependent drainage of abscesses, is far superior to the method of active mobilization. Usually, the results attending its use in infections of the soft tissues are superior to those obtained by other means. Surgeons must give an increased amount of attention to the physical factors in inflammation. Undoubtedly, bacterial products despoil tissues, but a great part of continuous inflammation is due to the compression effect of edema upon the venules. Immobilization reduces the oxygen required by muscle, and elevation, by reducing edema, with the attendant increased capillary blood flow, may abort infection and prevent suppuration.

CONCLUSIONS

1. Blood flow in an extremity is influenced by position of the latter, elevation reducing the arterial systolic pressure and skin surface temperatures, an increase of these values being observed during dependency.

2. The edema fluid pressure in experimental inflammation rises rapidly to the level of capillary blood pressure. The edema fluid in inflamed extremities of patients usually is under a tension higher than the venous pressure and often higher than midcapillary pressure. Thus, there develops an elevation of tissue tension 10 to 20 times that of normal. This tends to increase formation of edema fluid.

3. Immobilization and elevation reduce the tissue tension of an inflamed extremity.

4. The elevated skin surface temperature of an inflamed extremity parallels the greater blood volume flow.

5. Gravity may increase the leg volume 2 to 7 per cent during the day. In inflammation of an extremity the volume may be increased 50 per cent.

6. The increased volume of an inflamed extremity can be reduced markedly by elevation.

7. The protein content of edema fluid from inflamed extremities in patients and experimental animals approximates the blood plasma level.

8. Capillary blood pressure is increased in the inflammatory site so that the following equilibrium is approached:

Plasma oncotic pressure + capillary pressure=tissue oncotic pressure+tissue pressure.

The factors on the left, however, are preponderant, resulting in a continuous tendency toward edema formation.

9. Clinical trial suggests that immobilization and elevation are adjunct measures of distinct value in supporting the natural defense mechanism of the body in infections of the extremities. Their use appears to rest on a rational physiologic basis. The application of heat under these circumstances appears to be harmful.

SUMARIO

1. La circulacion de la sangre en una extremida es unfluenciada por su posicion. Su ele-

vacion reduce la presion sistolica arterial y la temperatura de la superficie de su piel. Estos valores aumentan durante su dependencia.

2. La presion del edema en las inflamaciones experimentales aumenta rapidamente hasta que llega al nivel de la presion capilar. La tension del edema en extremidades inflamadas is mayor que la presion venosa y muchas veses mayor que el de la presion midcapilar. Esto resulta en la elevacion de la tension en los tejidos de 10 a 20 veces mas de lo normal y favorece la formacion del edema.

3. La elevacion y la inmovilizacion reducen la tension de los tejidos en una extremidad inflamada.

4. La elevacion de la temperatura de la superficie de la piel de una extremidad inflamada paralelisa el aumento del volumen de la circulacion de dicha extremidad.

5. La gravedad aumenta el volumen de la pierna de 2 a 7 por ciento durante el dia mientras que la inflamacion lo puede aumentar hasta un 50 por ciento.

6. El aumento del volumen de una extremidad inflamada puede reducirse gran demente elevando dicha extremidad.

7. La tara proteica del edema de una extremidad inflamada de aproxima al del plasma de la sangre.

8. La presion capilar de la sangre aumenta en el sitio inflamado de tal manera que el siguiente equilibrio existe: La presion oncotica del plasma-presion capilar—presion oncotica del tejido—presion del tejido. Los factores de la izquierda son preponderantes, resultando una tendencia continua hacia la formacion del edema.

9. Clinicamente esto sugiere que la inmovilizacion y la elevacion son medidas terapeuticas de gran valor en el tratamiento de las infecciones de las extremidades. Su uso aparece ser racional y fisiologico. La aplicacion del calor bajo estas circumstancias es aparentemente danino.

RIASSUNTO

1. La circolazione del sangue negli arti e' influenzata dalla loro posizione. L'elevazione riduce la pressione arteriosa (sistolica) e la temperatura cutanea: l'abbassamento degli arti produce l'effetto inverso.

2. Nei processi infiammatori indotti sperimentalmente la pressione del liquido edematoso aumenta rapidamente, cosi da raggiungere quella della circolazione capillare. Negli arti infiammati la pressione del liquido edematoso e' generalmente maggiore della pressione venosa e spesso anche della pressione capillare. La tensione dei tessuti aumenta percio' da 10 a 20 volte quella normale, favorendo in tal modo lo sviluppo di edemi.

3. L'immobilizzazione e l'elevazione diminuiscono la tensione dei tessuti a livello della zona infiammata.

4. La temperatura cutanea segue parallelamente l'aumentato afflusso di sangue.

5. La forza di gravita' puo' aumentare, durante la giornata, da 2 a 7% il volume della gamba. Quando si stabilisce un processo infiammatorio l'aumento puo' raggiungere il 50%.

6. L'aumento di volume puo' essere notevolmente ridotto dall' elevazione della gamba.

7. Nei processi infiammatori naturali o sperimentali il liquido edematoso contiene una quantita' di protiene quasi equivalente a quello del plasma.

8. Nella zona infiammata la pressione capillare aumenta cosi da stabilire il suguente equilibrio: pressione oncotica del sangue—pressione capillare—pressione oncotica dei tessuti—pressione tissulare.

9. L'esperienza clinica dimostra che l'immobilizzazione e l'elevazione rappresentano delle misure terapeutiche molto importanti nel coadiuvare i meccanismi di difesa dell' organismo nelle infezioni delle estremita'. L'applicazione di calore appare invece dannosa.

RÉSUMÉ

1. La circulation sanguine d'une extremité est influencée par la position du membre; l'élévation réduisant la pression artérielle systolique et la température de la surface cutannée; si le membre est dépendant, on observe une augmentation de ces valeurs.

2. Dans l'inflamation expérimentale la pression du fluide, l'édémateux augmente rapidement et atteint le niveau de la pression sanguine capillaire. Le fluide de

l'édeme dans les extremités enflammées des malades a généralement une tension superieure á la pression veineuse et souvent a la pression mid-capillaire. Ainsi se développe une elevation de la tendon des tissus 10 a 20 fois au-dessus de la normale. Cela a une tendance à augmenter la formation des fluides oedémateux.

3. L'immobilisation et l'élévation réduisent la tension tissulaire dans une extrémité enflammée.

4. L'élévation de la température cutannée d'une extremité enflammée est augmentée avec un plus grand rapport sanguin.

5. La gravité peut augmenter le volume de la jambe de 2 a 7% durant le jour. L'inflamation d'une extremité peut augmenter le volume de l'extremité de 50%.

6. Le volume d'une extremité enflammée peut être réduit sensiblement par l'élévation du membre.

7. Le contenu de proteine du fluide oedémateux des extrémités enflammées des malades et chez les animaux de laboratoire est en rapport avec le niveau du plasma sanguin.

8. La pression capillaire du sang est augmentée dans les sites enflammés afin que l'équilibre suivant soit approché: Pression ancotique du plasma + pression capillaire = pression ancotique du tissù + pression tissulaire.

Les facteurs à gauche sont préponderants et entraînent une tendance continuelle vers la formation de l'édème.

9. Les essais cliniques suggèrent que l'immobilisation et l'élévation sont de grande valeur adjointes pour là défense mécanique du corps dans les infections des extrémités. Leur emploi repose sur une base physiologique rationnelle. L'emploi de la chaleur dans ces circonstances parait être néfaste.

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CORRECTION

In the April issue of the Journal of the International College of Surgeons the article titled Subphrenic Abscess, written by Hamilton Bailey, F.R.C.S., F.I.C.S., of London, was erroneously credited to Dr. M. J. Rajanna. For this regrettable error The Editors of the Journal tender their sincere apologies to the author, Mr. Hamilton Bailey.

Preoperative and Postoperative Care in Carcinoma of the Rectum and Pelvic Colon

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INTERNATIONALLY, the value of systematically planned preoperative, operative, and postoperative measures in surgery for cancer of the rectum and pelvic colon have been so repeatedly emphasized that the general acceptance of these principles is now universal.

It is my privilege to bring to this assembly a summary of progress manifest in American Clinics as a result of the acceptance of planned care of the cancer patient as presented herein.

The present status of mortality, resectability, operability, and survival can best be judged by observing statistics of follow-up in various centers where emphasis is on radical surgical cure, yet where in most cases a different surgical approach to the problem is followed.

At the Memorial Hospital in New York City, Binkley and Deddish consider the procedure of choice for resection of cancer of the rectum, the Miles abdominoperineal operation because it gives the patient the greatest chance of survival based on the assumption that, while eradicating the primary, it offers complete removal of the node-bearing areas. The mortality rates as reported by Binkley and Deddish [1] are outstanding and reflect the strides of the time toward radical cure. From 1930 to 1939 they report a mortality rate of 16 per cent. From 1940 to 1946, it was 2.3 per cent. In 1939, 130 consecutive operations for rectal cancer were done without a death. The five-year survival rate is 50 per cent.

On the other side of the picture, Bacon in Philadelphia reports an equally startling series for radical cures. The procedure of choice here is the abdominoperineal proctosigmoidectomy with conservation of the sphincter mechanism. In 1946, at the Fifth International Assembly of the International College of Surgeons at Lima, Peru,[2] we reported a series of 251 consecutive abdominoperineal proctosigmoidectomies with a mortality rate of 5.9 per cent; 145 radical resections had been performed without a single death. Recently,[3] Bacon has completed 379 proctosigmoidectomies with 18 deaths, a mortality of about 4.8 per cent. The five-year cure rate, including those for palliation as well as for cure, is 52.6 per cent. Of 560 cases employing various methods and reported recently,[4] 526 had been operated upon, giving an operability rate of 90.2 per cent; 467 were resected—a resectability rate of 80.1 per cent with a mortality from resection of 5.5 per cent (26 deaths).

At this clinic,† while all methods suitable at the time of operation for radical resection of cancer of the rectum are employed, it was found that the establishment of an abdominal colostomy and sacrifice of the sphincter muscles was unnecessary in a large percentage of cases. The proof of this is borne out by reflecting on the five-year survival rate.

Jones [5] of the Cleveland Clinic reports 139 consecutive combined abdominoperineal resections of the rectum from October 1941 to June 1943 without operative mortality, and 535 consecutive one stage abdominoperineal resections from 1942 to 1946 with 20 deaths, a mortality rate of 3.7 per cent. His survival rate is 52 per cent for five year cures.

Lahey [6] in 1946 reported a resectability rate of 83.5 per cent and a mortality rate of 3.8 per cent. A five-year nonrecurrence rate for his entire series of 1800 cases was 50 per cent. Dixon,[7] the champion of the anterior resection for low cancer of the rectum followed by establishment of intestinal continuity, has reported 340 cases operated upon with a mortality rate of 5.9 per cent from 1930 to 1945, and a mortality rate of only 1.1 per cent for the last five years of that period. His five-year survival rate, nonpalliative (palliative

* Read before the Sixth International Assembly of the International College of Surgeons, Rome, Italy, May 18–23, 1948.

† (Bacon) Department of Proctology, Temple University Hospital and Medical School.

cases excluded) is 67.7 per cent. It is of interest to note that Doctor Dixon's[8] curiosity to follow the technic of anterior resection was aroused when he observed that patients on whom he had performed the Hartman operation continued to live many years without recurrence. It is also of interest to note here that Dixon feels that the Miles operation is not sufficiently radical as his

Table 1. Mortality and Survival Rates

Clinics	No. of Cases	Mortality Per Cent	Consecutive Ops. No. Deaths	Survival 5 Yrs. Per Cent
Binkley: Memorial	—	2.3 (1940–1946)	130	50.
Lahey: Lahey Clinic	1800	3.8	—	50.[1]
Bacon: Temple University	379 A.P.P.S.[4]	4.8	145	52.6[2]
Jones: Cleveland Clinic	535 A.P.R.[5]	3.7 (1942–1946)	139	52.[2]
Dixon: Mayo Clinic	340 A.R.[6]	5.9 (1930–1945)	—	67.7[3]
		1.1 (1940–1945)		

[1] Five years without recurrence.
[2] Palliative cases included.
[3] Palliative cases excluded.
[4] Abdominoperineal proctosigmoidectomy.
[5] Abdominoperineal resections (Miles).
[6] Low anterior resection—intestinal continuity reestablished.

percentage of perineal recurrence was high. He has now performed between 200 and 300 radical posterior perineal resections including levators and part of the gluteus following single-barrel colostomy and preliminary ligation and division of the superior hemorrhoidal vessels. His results will be forthcoming shortly. Like Dixon, Gilcrest[9] feels that unless the gland-bearing area can be completely eradicated, the low anterior resection should not be employed, but that a Miles operation, or a modification thereof, should be used. His five-year survival for resection of the colon and rectum on 114 cases was 57 per cent. The operability rate on 200 cases reported was 75 per cent (Table 1).

Experience suggests that preoperative preparation paves the way for uneventful surgery and that, in turn, uneventful surgery, carefully planned and performed, paves the way for uneventful convalescence. Such preparation can be carried out seldom in less than a week. The preparation of the patient begins in the office where the success or failure of the operation can be decided. It has been my experience that it is best not to inform the patient of the true nature of the condition. The word "malignancy" can indeed be a frightening word and often demoralizes the patient, thus increasing our operative risk. The patient then is admitted to the hospital as an ambulant patient. Habits of a lifetime should not be disrupted abruptly. To evaluate the patient risk, careful physical examination is carried out, this to include electrocardiographic study, vascular status, evaluation of hepatic dysfunction, degree of anemia, prostatic hypertrophy, urinary dysfunction, and metabolic disturbances of sorts.

Caloric, Fluid and Electrolyte Balance. Since a large percentage of patients with cancer of the rectum and colon present varying degreees of metabolic disturbance, hypoproteinemia and avitaminoses with associated dehydration, a concentrated effort is made to place the patient in caloric, nitrogen, fluid and electrolyte balance, as well as in a state of high vitamin concentration. High protein, high carbohydrate and low fat diet is employed consisting of 400 Gm. of carbohydrate, 120 Gm. of protein, and 50 Gm. of fat. To

supplement this, 100 Gm. of Delcos Granules * daily are mixed with feedings (Table 2).

TABLE 2. DIET: LOW RESIDUE, HIGH PROTEIN, LOW FAT

	Grams	Calories
Carbohydrate	400	1600
Protein	120	480
Fat	50	450
Delcos Granules * (carbohydrate-protein mixture)	100	320
Total	670	2850

* Sharp and Dohme.

Fluids are forced, if not otherwise contraindicated, to insure a urinary output of 1000 cc. All fluid intake and urinary output is carefully recorded on special fluid balance charts. This will serve as a guide in determining postoperative fluid tolerance and output.

Hepatic Function. Apparently something happens coincident with the presence of the neoplasm which disturbs very seriously hepatic function. This so-called hepatic dysfunction reflects itself in lowered plasma protein, anemia and hypoprothrombinemia. For this reason determined efforts are made to evaluate preoperative liver function.

On the rectal service at Memorial Hospital several criteria are used for determining hepatic dysfunction.[10] Plasma bilirubin levels are carefully observed both preoperatively and postoperatively especially when multiple transfusions are being administered. Bilirubin levels of 1 mg. per cent or slightly above are normal. If they are higher, 2.5 to 3 mg., we suspect something to be wrong with the excretory ability of the liver. The second criterion is hypoproteinemia. Levels of 6.5 Gm. per cent of protein are aspired to. At the Bacon clinic studies were made on all cases with rectal cancer and it was reported [11] that 29.7 per cent of our patients were hypoproteinemic. The use of plasma, diet and hydrolysate is considered the best means of elevating protein blood levels. Usually these patients are also anemic and sufficient blood is administered in small daily amounts, together with injections of crude liver and iron, to raise the grams of hemoglobin to 14 per cent, and the erythrocyte count to at least four and a half million. In the presence of elevated serum bilirubin, however, we advise caution be employed in the use of whole blood. The third criterion to help determine liver dysfunction is hypothrombinemia. If we will but remember that vitamin K is necessary before prothrombin can be made by the liver, we should not then wonder why low levels can be a serious matter. Slow healing of wounds with oozing is often a sequel of this dysfunction which predisposes to sepsis and which in turn gives rise to postoperative loculations of pus and disruption of the postoperative incision. Hence, vitamin K, in doses of 20 mg., is given daily for three days prior to surgery and for three days thereafter. Other useful adjuncts in helping to evaluate hepatic status are plasma level of vitamin A and the cephalin flocculation test.

Vitamin Levels. It is a well-known fact that vitamin levels in most patients with rectal and colonic cancer are low in proportion to low chlorides, proteins and other basic elements. Inasmuch as the ability of the organism to absorb vitamins is disturbed seriously, an attempt should be made to overwhelm the patient with extremely high concentrations of vitamins. Orally, multiple vitamin capsules such as Zymacaps * containing:

Vitamin A	12,500 U.S.P. Units
Vitamin D	1,000 U.S.P. Units
Thiamine HCl	5 mg.
Riboflavin	5 "
Pyridoxine HCl	2 "
Calcium Pantothenate	10 "
Nicotinamide	30 "
Ascorbic Acid	100 "

are prescribed three times daily. Again three days preoperatively, intravenous supplementation with 1000 mg. of vitamin C, and Lyo B-C ** is carried out. Where capillary fragility seems more marked than normal, Rutin *** in 20-mg. doses is administered daily.

Antibiotic Therapy and Streptomycin. It

* Supplied by Sharp and Dohme.

* Upjohn.
** Sharp and Dohme.
*** Abbott.

is generally agreed that the greatest single advance in surgery of the colon and rectum has been the discovery and use of nonabsorbable sulfonamide antibiotics, and streptomycin. At the time the diagnosis of cancer is made the patient is placed on one of the nonabsorbable sulfonamide compounds, my preference being sulfathalidine * (phthalylsulfathiazole). For a patient weighing 70 kg. a dosage of 1.5 Gm. four times daily will produce the desired therapeutic effect in cleansing the colon.[12] Sulfathalidine is to be preferred to sulfasuxidine (succinylsulfathiazole) because dose for dose it is twice as effective for enteric bacteriostasis, is less toxic [12, 13, 14, 15, 16] and exerts a less diarrheic effect on the bowel. In studies made on the potency of sulfathalidine in 54 cases including 19 proctosigmoidectomies at Temple University Hospital, Department of Proctology, it was shown that sulfathalidine was more potent than sulfasuxidine and that in many cases the quantitative studies of the collected stools, after administration for five days of 0.1 Gm. per kilogram of body weight four times daily, often showed a reduction from 200 million to 10,000 coliform organisms in many cases. Postoperatively as soon as the patient is able to tolerate any fluids by mouth, administration of the drug in preoperative dosage is begun.

More recently we have supplemented therapy with streptomycin and it is felt the future in colonic surgery will hold more startling results. Streptomycin † has proved to be more potent than either succinylsulfathiazole or sulfathalidine when administered orally at the rate of two grams (two million units) daily providing, however, that it is not given for more than two successive days (48 hours) as it has been shown that beyond such dosage and time the coliform organisms develop a resistance to the drug and, regardless of the amount given thereafter, in most cases coliform organisms will continue to remultiply and a reversion of count will be noted.[16, 17] One-fourth gram in 2 oz. of saline, therefore, is administered orally every four hours for two days preceding operation and discontinued the day of surgery. At the present time I am also using 2 Gm. in saline in the peritoneal cavity following resection with open anastomosis.† Postoperatively, where contamination has occurred, 0.25 Gm. every four hours for two days intramuscularly, and 300,000 international units of penicillin in oil daily, intramuscularly, are prescribed for that same period. Sulfathiazole sodium is not employed preoperatively but 2.5 Gm. twice daily are administered postoperatively for 48 hours (Table 3).

TABLE 3. ANTIBIOTIC THERAPY AND STREPTOMYCIN

	Preoperative	Postoperative
Sulfathalidine (Phthalylsulfathiazole)	0.1 Gm./kg. b. wt. (5 to 7 days)	Same dosage when oral fluids are tolerated
Streptomycin	2 Gm. daily (48 hrs. before surgery) (0.25 Gm. Q 4 hrs. for 48 hrs.)	Same as preoperatively; intramuscularly — 2 days
Penicillin (oil)	None	300,000 units daily for 2 days
Sodium sulfathiazole	None	2.50 Gm. b.i.d., i.v. 2 days

Thirty-six hours prior to surgery, providing no obstructive element is present, castor oil (1½ oz.) is administered, followed in 24 hours by saline aspiration enemas until the return is clear. To insure complete intubation, a soft rubber tube of large size is left within the lumen of the rectum. An indwelling self-retaining catheter is placed within the bladder the condition of which had been evaluated preoperatively by cystometric studies [18] for bladder capacity and tonicity, and by cystoscopy for the presence of an encroaching extravesical lesion, and prostatic hypertrophy. A weighted intestinal tube * is passed to the stomach, connected to a

* Sharp and Dohme.
† Abbott, and Sharp and Dohme.

† Department of Proctology, St. Mary's, Highland, Park Avenue and Monroe County Hospitals, Rochester, New York.
* Cantor or Harris.

Wangensteen suction tube. It is continued in force during the operation, and postoperatively until all signs of abdominal distention have abated.

OPERATIVE CARE

The observation and care of the patient while in the operating room is of equal importance. Our * choice of anesthesia is continuous spinal or fractional anesthesia using 1 per cent pontocaine in 10 per cent dextrose solution. But the anesthetic agents selected depend on the anesthetist, his particular findings in the individual case, and the needs of the surgeon. Care must be used in strapping the patient to the table. Tight straps across the thighs, popliteal space or about the ankles are absolutely contraindicated because of vascular injury and therefore the predisposition to venous thrombosis. Airfoam rubber is used to protect the soft parts from the strap. Trendelenburg operating position is preferred because it permits the small intestine to be cleared from the pelvic operative field without the forceful use of packs, surely an important factor in avoiding the formation of adhesions. One thousand cubic centimeters of whole blood are always available and administered as needed during the course of operation. Continuous Wangensteen suction is maintained. Closure is always by figure-of-eight Jones type of closure and with Babcock alloyed steel wire, No. 32. The low incidence of skin infection reported [19] can be attributed in part to the use of wire.

POSTOPERATIVE CARE

Postoperative care unduly neglected may convert the most skillfully performed operation into a tragedy. Skilled nursing is imperative during the immediate postoperative period. Oxygen in high concentrations by tent, dome or mask is administered for 24 hours for the purpose of reducing the amount of body nitrogen and thus avoiding intestinal distention.[20, 21] Postoperative atelectasis should be watched for and measures immediately taken to correct it. If a bronchial plug is suspected, no time should be lost in aspirating the throat or performing bronchoscopy. Passive, and later active, movement of both lower and upper extremities is paramount to discourage venostasis. The lower extremities must be observed daily for tenderness together with unexplained pulse accelerations and apprehensiveness in the patient. Often the two latter may be the only indication of the formation of a silent venous thrombus. If suspected, no time is to be lost in placing the patient on heparin and dicumerol. Where a Miles resection has been performed and a large residual perineal cavity is present, I am inclined toward the performance of immediate bilateral femoral ligation instead of administration of anticoagulants.

Fluid Balance. Postoperatively, methods of determining the patient's water balance are paramount. In an attempt to estimate water balance we should have some idea of the patient's average postsurgical daily intake and should balance this against loss of fluid by respiration, insensible loss through perspiration, kidneys, gastrointestinal tract (vomiting, diarrhea), intraperitoneally per Babcock sump drains, and Wangensteen suction.[21] Sufficient fluids to insure a urinary output of 1,000 cc. is always a good norm to follow, but necessary supplementary methods to determine water balance should be employed, such as erythrocyte count, hemoglobin, hematocrit, and determination of serum protein and chlorides.

Administration of saline during the immediate postoperative period is avoided as salt is not well tolerated by the patient [22] especially in the presence of general body depletion of protein. It should not exceed 500 cc. daily at first unless an excess amount is being lost by vomiting, diarrhea, or draining areas. It has been my custom to employ 10 per cent glucose in sterile distilled water immediately after operation, to allow fluids freely by mouth providing the Wangensteen suction apparatus is functioning, and 1 oz. of water, every hour with the Wangensteen suction tube closed for 15 to 30 minutes. Gradually salt is restored in amounts of 18 Gm. daily, this usually being supplied in the form of 1,000 cc. of 5 per cent glucose in normal

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saline and in 1,000 cc. of amigen (a protein hydrolysate) * (Table 4).

TABLE 4. POSTOPERATIVE FLUID REGIMEN: EXAMPLE

First Day:	
Glucose, 10% in sterile distilled water	2500 cc.
Amigen,[1] 5% in 0.9% NaCl solution	500 cc.
Whole blood	250 cc.
Total	3250 cc.
Second Day:	
Glucose, 5% in 0.9% NaCl solution	1000 cc.
Amigen, 5% in 0.9% NaCl solution	1000 cc.
Whole blood	500 cc.
Sodium lactate, 6 molar solution	500 cc.
Total	3000 cc.
Vitamins in Infusion:	
Vitamin C, mg. 1000	
Lyo-B-C,[2] ampules 1	
Thiamine HCl	100 mg.
Riboflavin	10 mg.
Pyridoxine HCl	10 mg.
Calcium pantothenate	50 mg.
Niacinamide	250 mg.
Ascorbic Acid	200 mg.

[1] Mead Johnson.
[2] Sharp and Dohme.

Nitrogen Balance. Just as an attempt was made to maintain the patient in positive nitrogen balance preoperatively, so it is just as necessary to maintain this patient in positive nitrogen balance in the postoperative period. Since approximately 30 per cent of patients with rectal and colonic cancer are hypoproteinemic,[10, 22, 24, 25, 26] and since it is an established fact that the rectal cancer patients after resection not only lose protein rapidly but do not even make it very well,[10] every effort must be made to supply adequate amounts. High protein reserves should be aspired to preoperatively. In my patients this is accomplished postoperatively by means of the liberal use of small individual transfusions of whole blood, plasma and a protein hydrolysate. Nevertheless, the earliest possible return to a high protein, low residue diet is the best means of maintaining nitrogen balance. It is timely to mention that when the Miles type of abdominoperineal resection or abdominoperineal proctosigmoidectomy (pull-through) is performed, it is possible to begin postoperative oral feedings as soon as the colostomy clamp, in the former, is removed and/or the patient had his first bowel movement in either case. In anterior resection with end-to-end anastomosis, on the other hand, the period of postoperative oral starvation is prolonged and the transition to a preoperative diet is gradual, the patient being maintained on a low residue diet for approximately two weeks. Careful observation, therefore, of protein, chlorides, complete blood counts and hemoglobin must be made and intravenous fluid therapy continued over a longer period.

Urinary Bladder Management. Complications of the urinary tract postoperatively are rather frequent and first become evident 48 to 72 hours postoperatively. The preganglionic sympathectomy performed in freeing the rectum from its pararectal attachments[18] places the bladder in a state of hypotonicity with increased spasm of the detrusor. Likewise the posterior wall of the bladder is left without anything to push against when contracting because of removal of the rectum. The irritation caused at the trigone by the indwelling catheter causes bladder spasm. To avoid complications the bladder is irrigated daily through the self-retaining indwelling catheter with 1:4000 acriflavine solution and at no time is the bladder allowed to become overdistended. On the fifth postoperative day the catheter is removed and a urinary specimen is taken for laboratory study. Every eight hours the patient is catheterized for residual urine. If over three ounces remains after 48 hours, the catheter is replaced. It may often be necessary, especially after the Miles operation, to send the patient home with a catheter in situ and at times even transurethral resection may have to be resorted to. Following abdominoperineal proctosigmoidectomy at the Bacon clinic resort to transurethral resection was never necessary.

Variations may be necessary in the technical postoperative management of the cancer-resected patient, depending on the procedure

* Supplied by Mead Johnson.

followed. Where the Miles operation had been performed, the perineal pack is loosened on the second postoperative day coincident with removal of the colostomy clamp, and completely removed on the third and fourth postoperative days. It is our custom to irrigate the open perineal cavity daily with cod liver oil for seven days, and thereafter with 1 per cent ammonium bicarbonate solution. After abdominoperineal proctosigmoidectomy the perforated perineal drain is removed on the second day; the rectal tube is removed when the first bowel movement occurs. In either case the duodenal tube is removed after the first bowel movement and providing no abdominal distention is apparent. Where anterior resection has been performed, with immediate end-to-end anastomosis, preceded by colostomy or cecostomy, the patient is orally starved. Nitrogen balance is maintained parenterally for three days, or until the patient is returned to a low residue diet. Sulfathalidine, 4 oz. of 2 per cent solution, is instilled into the distal colostomy daily. Instillation into the distal colostomy of 1 oz. of glycerin to 3 oz. of water is carried out. This usually effects a bowel movement within 30 minutes. In the two former operations—abdominoperineal proctosigmoidectomy and the Miles procedure—the patient is out of bed walking on the fifth postoperative day; in the case of anterior resection on the first postoperative day.

Colostomy Care. It is not sufficient to carry the patient to an uneventful postoperative convalescence and then abandon him with a colostomy. As physicians and surgeons it is our duty to encourage, support, and instruct these patients so that they may be psychologically rehabilitated to a new way of life. On my service the patients are instructed on colostomy care, descriptive details being given in simple terminology. On the eighth postoperative day methods of irrigation are demonstrated, the patient gradually being taught his own care. Colostomy bags are best discouraged. Where the colostomy stump is too long, revision of the colostomy is done by electric snare several days before discharge from the hospital.

SUMMARY

Trends in reduction in mortality, increase in operability, and resectability rates, minimization of infections and lengthier survival for the cancer patient have been reviewed with the conclusion that the contributing factors are embodied in systematically planned preoperative, operative, and postoperative measures. Antibiotic therapy, utilizing sulfathalidine and streptomycin, has been the greatest single advance in surgery of the colon and rectum. Skilled nursing and careful observation and anticipation of postoperative complications, especially thromboembolism has done much to reduce mortality to a minimum. The instruction of the patient on colostomy care is briefly discussed.

RIASSUNTO

Dopo avere passato in rassegna le misure atte ad elevare la percentuale di operabilita', a ridurre la mortalita' operatoria, ad attenuare le complicazioni settiche, a prolungare la sopravvivenza degli operati, l'A. giunge alla conclusione che queste dipendono essenzialmente da una perfetta assistenza preoperativa, operativa e postoperativa. Nella chirurgia del colon e del retto, la terapia antibiotica (sulfatalidina, streptomicina) segna un progresso decisivo. La mortalita' postoperatoria e' stata notevolmente ridotta grazie ad una corretta alimentazione, un'accorta osservazione e prevenzione delle complicazioni, con speciale riguardo alle tromboflebiti ed ambolie. L'A. discuite infine le istruzioni da darsi ai pazienti dopo la colostomia.

SUMARIO

El autor hace una revista de los factores que contribuyen ha disminuir la mortalidad y morbilidad en la cirujia del cancer del colon y del recto y que dependen de las medidas pre y post operatorias que se instituyan segun el caso.

La terapeutica moderna antibiotica que usa la sulfatalidina y la estreptomicina es quizas el advance de mayor valor en el tratamiento de estos casos. El cuidado post-operatorio incluyendo la observacion experta anticipando las complicaciones, especialmente la tramb-

flebitis han contribuido mucho ha reducir la mortalidad.

El autor tambien discute las instrucciones que se deben de dar al paciente en el cuidado de la colostomia.

RÉSUMÉ

L'auteur passe en revue la réduction de la mortalité, l'augmentation des indications opératoires, l'étendu de resection, la diminution des infections et la survivance prolongée des cancéreux et arrive à cette conclusion que les facteurs qui ont contribué à ces grands progrès sont dus a l'étude approfondie des traitements preopératoire, opératoire, et postopératoire. La therapie antibiotique, utilisant la sulfathalidine et la streptomycine a grandement avancé les progrès de la chirurgie du colon et du rectum. L'observation soignée et l'anticipation des complications postopératives surtout le thromboembolisme ont reduit la mortalité au minimum. Les recommandations à donner aux malades après la colostomie sont considérées et formulées brièvement.

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Postpartum Dissection and Repair of Preexisting Perineal Relaxation

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CHARLESTON, WEST VIRGINIA

THE correction of a preexisting perineal relaxation should be considered during hospitalization of the patient for a subsequent delivery. Bubis,[1] Pride,[7] Costello,[2] and King[6] have reported favorably on this procedure.

There are several reasons favoring repair at this time. The mother is discharged from the hospital in better condition than when admitted. This usually means a more complete and prompt convalescence, less discomfort, less pelvic pressure symptoms, more rapid involution of the pelvic organs, quicker healing with fewer ulcers of the cervix, and less backache. Following an adequate perineal repair, there is an increase in energy, and improved marital adjustment, with accompanying improvement in her general feeling of wellbeing. She is usually better able to nurse and care for her baby. She should, however, be warned that the first few postoperative days will be uncomfortable.

From the standpoint of the physician, the postpartum dissection for adequate perineal repair is important. It gives him an assurance of "work well done" when the patient is discharged from the hospital in better condition that she was before delivery.

The advantages of performing this operation while the patient is in the hospital for a delivery are expense and expediency. It is of economic importance to the patient because the hospital stay and disability coincide for both the delivery and the operation. It is expedient because the patient frequently will not return for the operation if she is allowed to go home with a vague plan to return for a subsequent surgical correction.

All of these advantages are valid only if there is no increased hazard to the patient, and when the operation presents a minimum of technical difficulties.

There are, to be sure, definite contraindications to such an elective surgical procedure which are not to be disputed. Among these are infection, hemorrhage, phlebitis, cardiovascular diseases, or wasting or debilitating disease.

There are also possibly other debatable criticisms of the postpartum dissection and repair of a preexisting relaxation.

1. No additional surgery is advisable at the time of delivery. Pregnancy and labor are thought to be enough strain on the patient's physical resources, without an additional surgical procedure.

2. Increased vascularity of the perineum at the time of delivery increases the hazard of blood loss.

3. The extreme friability of the tissues at the time of delivery makes the operation technically difficult.

4. Increased susceptibility of the patient to infection at this time.

These criticisms may be discussed one at a time: *Pregnancy and Labor Enough Strain, Without Surgery.* Generally speaking, the patient who needs a correction of preexisting relaxed perineum has a comparatively easy delivery. It is usually quick, and tissue stretching and damage are at a minimum because the stretching has occurred previously. Frequently one finds that the easier the delivery of a normal size fetus, the greater the need for a perineal repair.

Blood Loss. If a method can be devised which reduces blood loss, the extreme vascularity of the perineum will not be too great a factor. The author[3,4] has worked out a technic for perineal dissection and repair which includes the local injection (Fig. 1) of saline solution with adrenalin to aid in dissection and to minimize the blood loss. The vascularity admittedly is greater in the perineum associated with delivery, but the use of saline with adrenalin definitely reduces the vascularity, decreases the blood loss, and facilitates the operative procedure in general.

Tissue Friability. A part of the technic of the operation mentioned above includes steps especially planned to overcome the disadvantage of postpartum tissue friability.

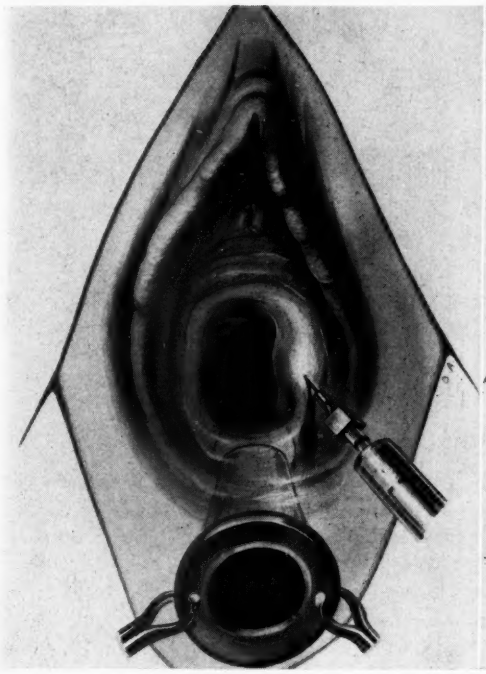

Fig. 1. Injection of solution (30 cc. normal saline with 3 drops adrenalin) under posterolateral wall of vagina, 2 inches within the orifice, deeply about the levator ani musele. For hemostasis and partial dissection. (To be repeated on opposite side.) An Allis forcep to catch mucosa is helpful in holding tissues and facilitating injection. The large dilator (4 inches long, 1 inch in diameter) is seen held in the rectum by towel clamps attached to skin. (Courtesy, American Journal of Obstetrics and Gynecology.)

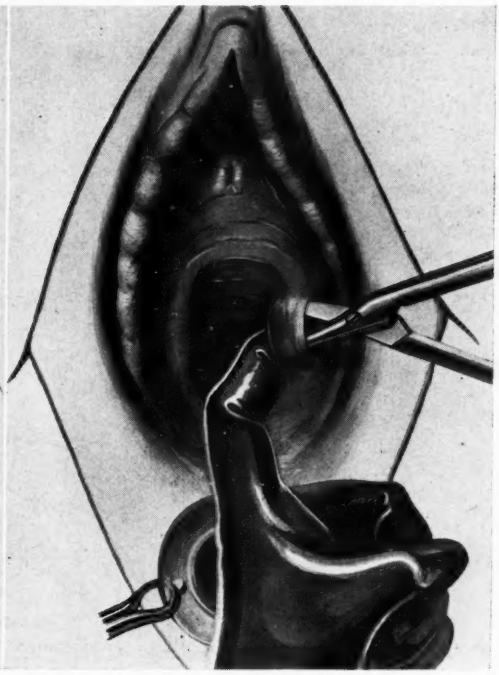

Fig. 2. A 1-inch, vertical stab wound at 4 and 8 o'clock at the vaginal orifice made with curved, blunt-tip scissors which are then inserted deeply through stab wound (2 inches), opened wide, and withdrawn. Proper layer easily identified by shiny, bluish-white appearance of fascia. With the finger in vagina (to guide scissors), the thickness of mucosa-fascia layer gives the feel of about 6 sheets of ordinary paper. Keep tip of scissors up, away from rectum. (Courtesy, Americal Journal of Obstetrics and Gynecology.)

The same technic has also been found to be of advantage in routine perineal repair.

The essential points of this modified dissection for perineal repair are:

1. Injection of one ounce of normal saline solution with adrenalin (2 or 3 drops to the ounce) deeply about the levator ani muscles, left and right. This facilitates dissection and decreases blood loss by vasoconstriction (Fig. 1).

2. The dissection is accomplished chiefly through the initial 1-inch bilateral stab wounds at eight and four o'clock (Fig. 2). The levator ani muscles are dissected as the first step of the operative procedure (the area previously injected), and the vaginal wall (Figs. 3 and 4) is separated from the underlying structures *from above downward.* This method of approach avoids the very friable tissues, finds quickly and keeps in the proper layer. Also less bleeding and less adherent scar tissue are encountered.

The operation proceeds as shown in Figs. 5 and 6, the stab wounds being connected (5) and the classical dissection of the posterior wall flap is completed from below upward in the conventional manner (6).

3. A large rectal dilator (Figs. 1 to 6) distends and identifies the rectum uniformly along the entire course of the operative field, thus facilitating tissue identification for dissection and suturing. The muscles are more easily found and dissected, the rectum is avoided.

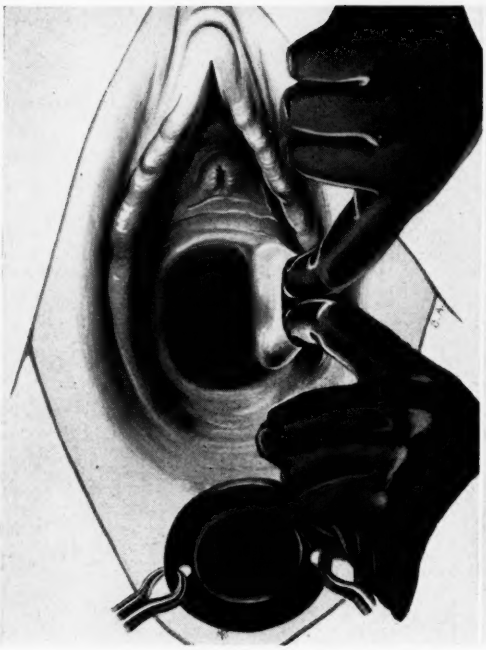

Fig. 3. Dissection of levator ani muscles with index fingers through stab wound. First one finger is inserted high up past the levator ani muscle band. Pressure is made laterally in dissecting the muscle. Then the fingers are turned medially and structures are separated *from above downward*, away from the undersurface of the mucosa-fascia layer. (Courtesy, American Journal of Obstetrics and Gynecology.)

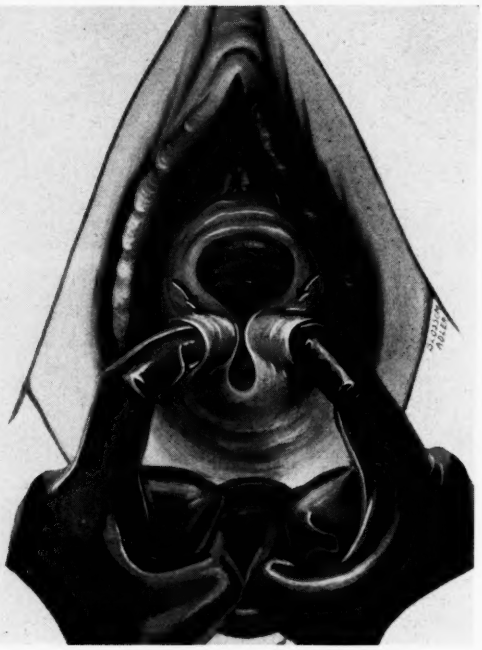

Fig. 4. The index fingers in the left and right stab wounds dissecting the structures *from above downward* as much as can be accomplished by gentle blunt dissection. (Courtesy, American Journal of Obstetrics and Gynecology.)

Increased Susceptibility to Infection. The answer here must be in terms of results. What have been the findings and results of the cases studied?

The author has performed and surveyed * 100 immediate postpartum perineal dissections and repairs. The results have been found to be satisfactory. All cases were discharged from the hospital within the usual 10 days after the operation and delivery; frequently, on the third to fifth postoperative day. Elevations in temperature, reported in the accompanying table, promptly subsided. Other unfavorable findings occasionally observed were marked swelling of the vulva and urinary retention requiring catheterization for seven to ten days.

* Subsequently an additional 75 cases have been added to this series with even fewer unfavorable reactions.

In the total of 100 cases surveyed, the following unfavorable reactions were found:

	No.	Per Cent
Marked swelling of vulva	2	2
Urinary retention, requiring repeated catheterization for longer than 5 days	2	2
More than normal postoperative bleeding	1	1
Temperature elevation (100.6 or over)	4	4

If a postpartum perineal dissection and repair is to be done, there are factors to be considered in determining when it is to be undertaken; that is, at the time of delivery, or on the first to fifth day following delivery. Chief among the factors to be considered are uterine blood loss (during delivery), the possibility of shock associated with the delivery, and other factors concerning the welfare of the mother or child which may require the

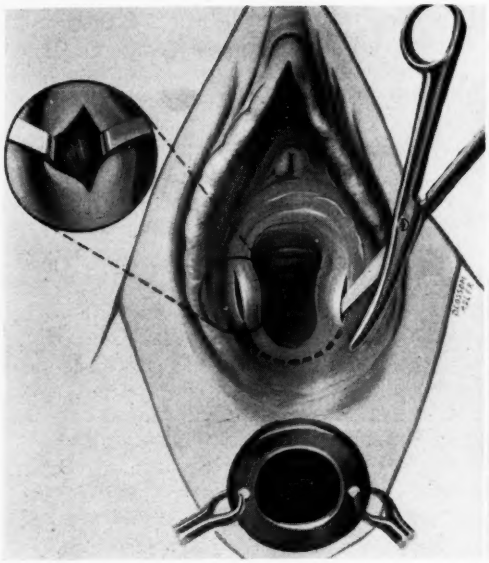

Fig. 5. The posterior ends of the bilateral, deeply and completely dissected stab wounds are being connected. *Insert:* Retracted stab wounds showing muscles exposed with chief parts of dissection quickly completed through stab wound in less vascular, non- (or slightly) traumatized region; away from adherent areas. Wound is dried with gauze and then packed with gauze dipped in saline: adrenalin solution. Thus bleeding is further controlled. (Courtesy, American Journal of Obstetrics and Gynecology.)

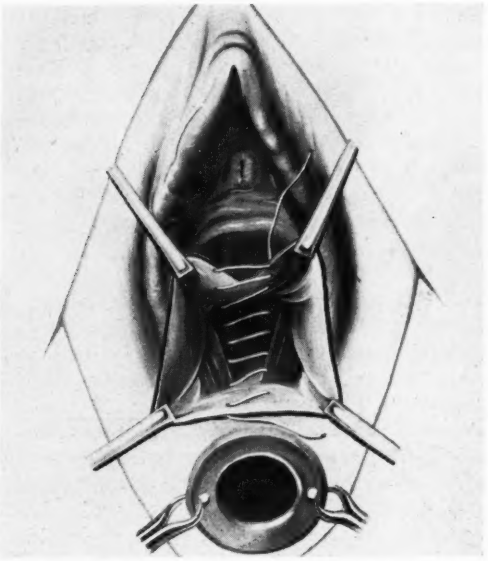

Fig. 6. Routine, classical dissection of the vaginal mucosa-fascia layer from the underlying structures has been completed from below upward, the wedge-shaped segment removed. The large long rectal dilator is shown in place. This gives uniform, complete dilation along the entire lower bowel, which is involved in the operative field. Thus, the rectum is quickly, aseptically, completely, identified from the operative wound above for dissection and suturing. Running mattress suture for plication of the fascia overlying the rectum and the fascia under the vaginal mucosa. (Courtesy, American Journal of Obstetrics and Gynecology.)

immediate, undivided, prolonged attention of the physician.

The advantages of doing the perineal repair while the patient is on the table for delivery are: (1) A second anesthesia is avoided. (2) The psychologic factor of "another operation" is avoided. (3) The additional expense for a second anesthesia, and repeated use of the delivery (or operating) room is avoided. (4) The time factor (the physician, the hospital staff, and the operating room schedule). While the patient is in the delivery room, in stirrup position, with all instruments available, only 20 to 30 minutes additional time is usually required to complete the perineal dissection for repair.

The only additional time required in this type of procedure, in contrast to that for episiotomy which, in many hospitals, is almost routinely considered for primipara, is that required for the dissection. Suturing is similar to the suturing of the episiotomy.

In this connection nerve-block anesthesia for delivery (spinal, saddle, caudal) has many advantages. The writer's choice is low spinal anesthesia. An additional operating time of 20 to 30 minutes under an existing anesthesia (which continues to be effective) minimizes anesthesia factors.

The perineal repair done on the first to fifth day following delivery, has certain advantages: (1) The whole procedure is more elective. The choice of time is left to the obstetrician (or surgeon), rather than having it chosen by a stroke of nature. When the patient goes into labor spontaneously, there is no choice of time. Unnecessary procedures may have to be curtailed owing to the condition of mother or child or due to the fact that others may be waiting for the delivery room. A choice of time, and a more deliberate procedure has a definite advantage here.

2. Better preparation and condition of the operative field. There are times when labor progresses so rapidly that the most ideal preparation and enemas are not available. This is better controlled when the surgical procedure has been postponed. Then the lower bowel is more adequately cleansed, and more time can be allowed for exacting scrutiny in preparation of the vaginal surgical field.

3. Cooperation of patient. In the rush which inevitably accompanies a certain number of obstetrical patients, especially with general anesthesia, the field is sometimes inadvertently contaminated by movement of the patient or disruption of drapes. *It would be poor judgment, indeed, to continue with an elective surgical procedure under less than ideal conditions.*

4. The fourth or fifth postoperative day has some advantages. The tissues have become more firm, are much less friable, and consequently are more easily dissected.

I have long been convinced [5] that the sitz bath is the method of choice for postoperative perineal care both in obstetrics and gynecology. The observation of over 3,000 cases over a period of 12 years using "the sitz bath method" convinced me that the healing is better and the convalescence hastened with greater comfort to the patient.

Special attention should be directed toward adequate emptying of the bladder. Adequate medication should be prescribed for the expected discomfort.

SUMMARY

Dissection and repair of preexisting perineal relaxation at the time of a subsequent delivery has certain advantages for both patient and physician. Essential points of advantage in the new technic presented are: (1) Local injection of saline with adrenalin to facilitate dissection and hemostasis. (2) Bilateral stab wounds for dissection of levator ani muscles and *dissection from above downward*, thus dissecting where tissues are less friable—less vascular—less scar tissue. The proper plan is more easily followed. (3) A large rectal dilator (1 inch in diameter, 4 inches long) facilitates tissue identification, dissection and suturing. (4) Procedure is much more quickly completed.

Results of 100 postpartum perineal dissections and repairs were favorable in all cases. A few instances of minor, temporary complications were noted.

The sitz bath is advised for postoperative care.

RIASSUNTO

Nei casi di ptosi del piano perineale un' operazione plastica eseguita al momento del parto successivo offre dei notevole vantaggi.

L'operazione viene eseguita: (1) dopo infiltrazione locale di soluzione fisiologica con adrenalina onde esporre meglio i piani di clivaggio e favorire l'emostasi. (2) con una doppia incisione, dall'alto in basso, allo scopo di porre in evidenza e ravvicinare bilateralmente, i muscoli dell'ano (3) onde facilitare l'identificazione, la dissezione e la sutura dei tessuti, un largo dilatatore metallico viene introdotto preventivamente nel retto.

La plastica perineale viene eseguita—in queste condizioni—piu' facilmente e piu' rapidamente che nell'intervallo fra i parti. I risultati sono stati tutti favorevoli sopra cento casi cosi' operati.

SUMARIO

La reparacion de las roturas pre-existentes del perineo en el parto siguiente ofrece ciertas ventajas pare el paciente y para el medico. En la tecnica nueva que se ha presentado hay cietos puntos ventajosos, que son: (1) La inyeccion local de solucion salina con adrenalina para facilitar la diseccion y favorecer la hemostasis. (2) La incision bilateral a modo de herida de cuchilla para ayudar la diseccion de los musculos elevadores del ano y cuya diseccion se comienza de arriba abajo. (3) La introduccion de un dilatador rectal de largo calibre (2½ cm. de diametro y 10 cm. de largo) el cual facilita la identificacion de los tejidos y su correcta sutura. (4) Este procedimiento se puede llevar a cabo en menos tiempo.

Los resultados obtenidos en 100 casos de reparaciones del perineo en el periodo del post-parto han side favorables en todas.

En el cuadro 1, se presentan las complicaciones que ocurrieron en esta serie.

RÉSUMÉ

La dissection et la correction du relâchement préexistant au moment d'un accouchement subséquent presente certains avantages pour le malade et pour le médecin. Les mesures avantageuses de la nouvelle technique sont:

1. Injection locale de saline (solution) avec adrenaline pour faciliter la dissection et l'hémostase.

2. On disséque les muscles élévateurs de l'anus de haut en bas; car ici ces tissus sont moins friables, moins vasculaires et renferment moins de tissus cicatriciel.

3. On emploie un dilateur rectal ayant un pouce de diamêtre et 4 pouces de longueur; cela facilite l'identification, la dissection et la suture des tissus.

4. Ce procédé donne une operation plus complète et prend moins de temps.

Les resultats de 100 dissections postpartum perineales et leur réparation furent étudiés et furent trouvés favorables dans tous les cas. Des complications temporaires presque négligables sont notées dans la Table N. 1.

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Epithelization Time After Gastrectomy*

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WHILE the literature on surgery of gastroduodenal ulcer is voluminous there are few reports available on the time of epithelization of the surgical wound in the mucosa of the stomach and intestine.

Apparently, Marchand was the first to occupy himself with this question and published his results in 1893. This was an experimental investigation of the manner in which cicatrization of mucosal wounds took place and the length of time necessary for its complete accomplishment.

Pozzi, Griffini and Vassale also studied epithelization after excision of 2 to 3 cm. of the stomach mucosa. According to Pozzi, who experimented on dogs, regeneration of the superficial epithelium is effected in 7 to 10 days but becomes physiologic after a few months. Griffini and Vassale admit that 10 to 15 days after excision of 2 to 3 cm. of the mucosa the site of excision is found only with difficulty. The glandular alveoli are formed in 40 days and the secretion of gastric juice from the area takes place within 90 days.

Gara and Neusillof, experimenting on dogs and rabbits, made an incision through the entire wall of the stomach and then closed it with a Mikulicz-Albert suture. A few hours after suture the changes in the wound lips are slight. After one or two days the lips present necrotic changes—bloody and inflammatory infiltration. After six days the necrotic portions between the traumatic lips are shed, disclosing areas of regeneration. After a fortnight the lips of the mucosa approach each other and in 24 days the gap is replaced by granulation tissue. Within 32 days restoration of the mucosa is complete.

Gara's experiments were especially interesting. He demonstrated that with three rows of sutures the gap in the mucosa is much smaller and cicatrization is completed sooner.

Hertel questions the value of necropsy findings because of postmortem anatomic changes.

Summing up the reported results of research it may be said that: After resection of a portion of the mucosa, epithelization is completed within 7 to 15 days. After incision through the entire wall of the stomach more time is necessary for epithelization.

Process of Epithelization. The gap in the mucosa is at first covered by flat epithelium which later is transformed into cuboidal and cylindrical epithelium. The regenerative ability of the mucosa is good in spite of the presence of gastric juice. More time is required for restoration of the glands. Both the epithelium of the divided glands and the covering epithelium contribute to the restoration of the glands (Mathews). Healing of the muscularis is effected by cicatrization. In the intestine epithelization takes place in a way similar to that in the stomach, but the conditions are simpler because the epithelium of the glands, which is similar to the surface epithelium, contributes to epithelization. Obstruction of a glandular tubule (follicle) on a spot of epithelization may induce cyst formation which Close has called epithelial cyst of traumatic lips.

Close, Rosebaum and Canne oppose the use of the thermocautery on the ground that it retards epithelization of the wound, provokes a more intense inflammatory infiltration, postoperative hemorrhage, septic embolism, etc.

FECAL HEMOGLOBIN AND EPITHELIZATION TIME

Our studies on the time of epithelization of the surgical wound in the gastroduodenal tract, especially of the gastroenterostomy wound, was undertaken for two reasons: (1) The great clinical importance of the time of epithelization; (2) the bearing which the length of time required for epithelization has on diet after gastrectomy.

Our study was an investigation of the blood in the feces of gastrectomy patients. The Meyer reaction was employed for this purpose as being most sensitive.

In a series of 149 patients who had undergone gastrectomy we examined the feces for

* Second Surgical Clinic of the University of Athens.

hemoglobin from the fifth day after operation until the Meyer reaction became negative. In a few cases the first negative reaction was followed by a positive, but within two or three days the reaction became finally negative. Naturally, the patients examined for hemoglobin in the feces were put on a diet which after digestion leaves no hemoglobin. We particularly stress the fact that, in order to eliminate erroneous results, the patients used in the study were as a rule those in which a radical resection of the stomach with the ulcer had been performed, in order to avoid erroneous results which might occur in the presence of ulcer. Furthermore, the technic was the same employed by all operators (submucous stitches, two rows of sutures, etc.), which also helped to exclude error.

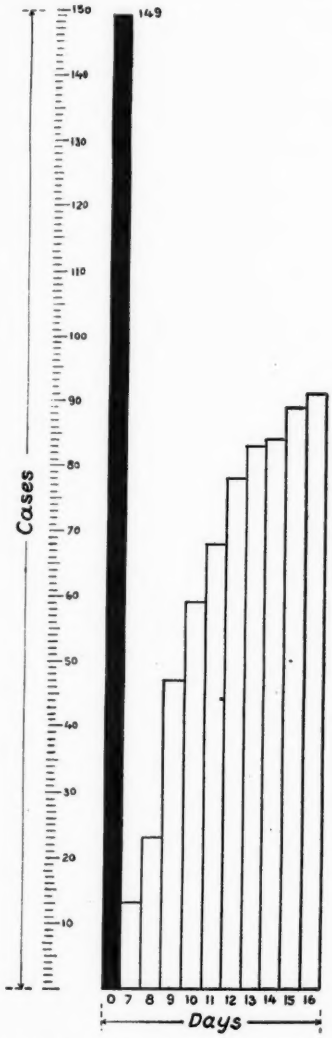

Fig. 1. Total number of cases operated on (black column) and the cases which were negative for hemoglobin (white column).

The results in 149 cases may be noted in Figure 1.

In 14 of the 149 cases the reaction became negative by the seventh postoperative day.*

TABLE 1.

Cases	Postoperative Day Reaction Became Negative
14(14)	7th
23(9)	8th
47(24)	9th
59(12)	10th
68(9)	11th
78(10)	12th
82(4)	13th
84(2)	14th
89(5)	15th
91(2)	16th
58(58)	contin. positive after 16th day

Total 149

It is clear that in 47 cases the Meyer reaction became negative between the seventh and ninth postoperative days while 44 became negative between the tenth and sixteenth postoperative days. In 58 cases the reaction continued positive even after the sixteenth day. We also compared the rate of epithelization of the gastrectomy wound where the surgical knife and where cutting diathermy were employed. The prevailing opinion has been that the use of thermocautery should be rejected because it exerts a retarding influence upon the cicatrization of the wound. Some surgeons still believe that the use of

* In some operations the surgical knife was used, in other cutting diathermy.

cutting diathermy in surgery of the gastrointestinal tract must be avoided because it can provoke electric shock of the tissues and necrosis, resulting in inadequacy of the suture. This is incorrect, however, and we must not disregard the contribution of diathermy to the progress of the surgical technic in general and to surgery of the stomach in particular. Figure 2 shows that the Meyer reaction became negative in a greater number of cases in which cutting diathermy was used as compared with those in which it was not.

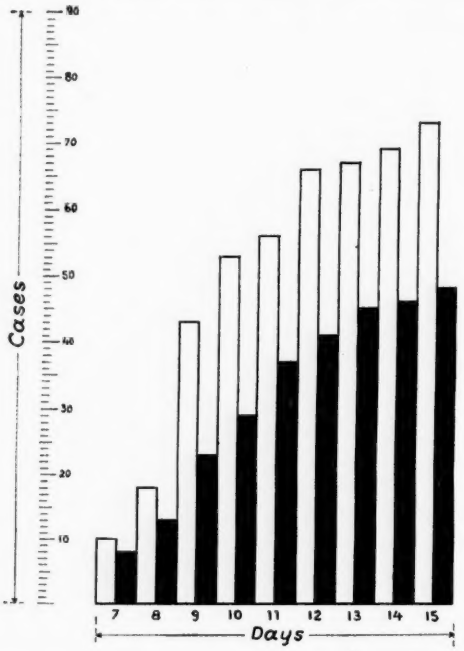

Fig. 2. White columns show the cases which were negative for hemoglobin by use of cutting diathermy. Black columns show those operated on with the surgical knife.

Using the disappearance of hemoglobin from the feces as a criterion, we must conclude that the results refute the view of a retarding action of the diathermy knife on wound cicatrization. On the contrary, this technic contributes considerably not only to perfect hemostasis, but also to earlier cicatrization of the wound.

Again, using as criterion the negative reaction for hemoglobin in the feces we point out that epithelization is complete in some of the cases by the seventh postoperative day, though the epithelium may not yet be physiologically functional, as pointed out by Pozzi.

The fact that our results do not agree with those of Gara according to whom the wound through the stomach wall is filled with granulation tissue in 24 days and completely epithelized within 32 days, may perhaps be due to progress in the operative technic of gastrectomy. Also, comparisons between animal and human experiments must be made with reservations.

The Meyer reaction after gastrectomy may have some clinical value besides indicating the progress of wound epithelization. A Meyer reaction that continues to be positive indicates that the cicatrization of the wound is not yet completed and the diet must be adjusted accordingly.

SUMMARY

The time necessary for epithelization of the gastroenterostomy wound was studied by investigating the hemoglobin in the feces. From this study the following conclusions could be drawn:

1. By the seventh postoperative day the feces were negative for hemoglobin in a substantial number of cases.

2. In 91 of 149 cases, or 61 per cent, the feces were negative for hemoglobin by the sixteenth postoperative day.

3. Where cutting diathermy was employed the feces became negative for hemoglobin earlier, indicating earlier cicatrization of the wound.

4. The investigation of the feces for hemoglobin is recommended on a large scale for postgastrectomy patients, as a guide to convalescent diet for these patients.

SOMMAIRE

Le temps nécessaire pour l'épithélisation de la plaie gastro-entérostomique fut etudié par la recherche de l'hémoglobine dans les matières fécales. De cette étude, les auteurs tirent les conclusions suivantes: (1) Vers le septieme jour postopératoire, les fèces furent

négatives pour l'hémoglobine dans un nombre de cas. (2) Dans 91 de 149 cas ou 61% des cas, les fèces furent négatives pour l'hémoglobine vers le 16ème jour postopératoire. (3) Après l'emploi de la diathermie coupante, les fèces furent négatives pour l'hémoglobine plus tôt, indiquant ainsi une cicatrisation moins tardive de la plaie. (4) L'analyse des fèces pour l'hémoglobine est à recommander chez les malades soumis a la gastrectomie. Cette analyse sert de guide pour choisir la diète appropriée pour les convalescents des opérations sur l'estomac.

SUMARIO

Los autores han investigado la hemoglobina de las heces como un indice de la epitelizacion de las gastro-enterostomias. Y presentan las siguientes conclusiones:

En un numero cubstancial de casos la hemoglobina desaparace de las heces en el septimo dia post-operatorio.

En una series de 149 casos 91 o el 61% las heces fueron negativas en el decimo sexto dia.

Los casos operados con el escalpelo electrico (diatermia) sus heces se hiceron negativas mas tempranamente, indicanda mas rapida cicatrizacion.

Se recomienda la investigacion de ha hemoglobina de las heces como un procedimiento post-operatorio en las gastrectomias por cuanto sirve de guia en el regimen dietetico durante la convalesencia.

RIASSUNTO

Hanno studiato il tempo necessario per l'epitelializzazione della gastro-enterostomia attraverso la ricerca dell'emoglobina nelle feci. Sono giunti alle seguenti conclusioni: (1) In moltissimi casi l'emoglobina scompare gia' sette giorni dopo l'operazione. (2) Sopra 159 casi, in 91 (61%) l'esame delle feci e' riuscito negativo 16 giorni dopo l'operazione. (3) L'emoglobina scompare prima, indicando percio' una piu' rapida cicatrizzazione della ferita, allorquando viene usato il coltello diatermico. La ricerca dell'emoglobina e' un utile sussidio per guidare l'alimentazione dei pazienti operati di gastroenterostomia.

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Clinical Evaluation of a New Technic in the Sclerotherapy of Varicose Veins

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IN 1944 I described a new technic for the injection therapy of varicose veins.[1] In that technic dilution of the sclerosing agent with blood was prevented, at least for a short time. It consisted of the introduction of a small volume of air into the lumen of the vein, preceding the injection of the agent. Displacement of the blood by air permitted the undiluted solution to act directly on the intima, thus producing a more effective destruction of the intima-endothel than had been possible by conventional methods. The term, conventional methods, is used to refer to the methods of injection commonly employed in which the solution is either injected into a vein filled with blood ("full vein" technic, Riddle[2]) or into an empty vein ("empty vein" technic, McPheeters[3]). While theoretically ideal, the "empty vein" technic is not used widely owing to technical difficulties and the inherent danger of paravenous injection.

AIR-BLOCK TECHNIC

The patient is injected while standing upright. One cubic centimeter of air is aspirated into the syringe previously filled with the sclerosing agent while holding the syringe with the needle pointing upward. The injection is made, while holding the syringe in approximately the same position so that first the air, and then the solution is injected. As soon as blood appears in the syringe, the air and the sclerosing solution are injected with continued movement. This procedure is illustrated in Figure 1.

The first impression of the reader might be that this procedure involves the danger of air embolism. That this is not the case has been discussed extensively in a previous paper.[1] It has been shown that air embolism never occurs when a small amount of air is introduced into the saphenous veins or their tributaries. According to H. F. Richardson and coworkers,[4] 480 cc. of air has to enter the venous system within 20 to 30 seconds to cause death in a person weighing 132 lbs. A search of the literature fails to disclose report of the occurrence of air embolism when air entered the saphenous vein or its tributaries. Furthermore, in my practice this method has been used for over 5 years in hundreds of injections without a single incident of air embolism.

SCLEROSING AGENTS

The following is a report of a comparative study consisting of three series of injection treatments of varicose veins, each comprising 293 injections.

In the first two series, the standard solutions using the conventional and the air-block method were recorded and then compared (Table 1). In the third series the air-block technic was used in combination with a new sclerosing agent, Sotradecol* (Table 2).

The following sclerosing agents were used:

1. De-L-S. This is a solution containing 15 per cent lithium salicylate plus 25 per cent dextrose. About 5 cc. of this solution were injected at any one site. The solution was used mainly in the treatment of large varicosities.

2. Varisol. This agent is similar to De-L-S, as it is also a hypertonic solution, consisting of 30 per cent invert sugar and 15 per cent sodium chloride. The solution was used only for very large veins, 10 cc. being injected.

With Varisol and De-L-S the empty vein technic was followed in most instances.

3. Quinine Hydrochloride and Urethane. This solution contains quinine, 2 gr., and urethane, 1 gr. per cc. It was used in a small percentage of the cases in doses of ½ to 2 cc.

4. Water-Soluble Salts of Fatty Acids. To this group belong the following agents: sodium morrhuate 5 per cent, used in doses

* Material for this study was supplied by the Research Department of Wallace & Tiernan Products, Inc.

Fig. 1. With the patient standing, the syringe is held almost vertically. The plunger is retracted, and about 1 cc. of air is aspirated into the syringe above the sclerosing agent. The needle is inserted into the vein. Blood appears in the syringe. With one continuous motion, first the air, and then the sclerosing agent are injected into the vein.

of ½ to 5 cc.; monolate and ethalate (monoethanolamine oleate 5 per cent), used in doses of ½ to 5 cc.

RESULTS

The summary of the results obtained with these agents, using the conventional method and the air-block technic, is given in Table 2.

Of the 293 injections made by conventional methods, 212 resulted in complete obliteration and 11 in partial obliteration. Local reactions were observed in 35 instances, and sloughing occurred in 15 cases. Using the same solutions in combination with the air-block technic, out of 293 injections 241 produced complete obliteration, 23 partial obliteration; local reactions were produced in 23 instances, and sloughs were encountered twice.

In view of the fact that the results with various soluble fatty acid salts were rather similar, this group was considered as homogeneous, and is summed up in Table 3. It can be seen that the incidence of complete obliteration increased more than 10 per cent when the air-block technic was adopted. The inci-

TABLE 1. COMPARISON OF THE CONVENTIONAL AND "AIR-BLOCK" TECHNICS

Sclerosing Agent	No. of Injections		Complete Obliteration		Partial Obliteration		Reactions		Sloughs	
	Conven. Method	Air-Block Method	Conven. Method	Air-Block Method	Conven. Method	Air-Block Method	Conven. Method	Air-Block Method	Conven. Method	Air-Block Method
De L S	13	46	8 (61.5%)	37 (80.4%)	1 (7.7%)	6 (13.0%)	1 (7.7%)	2 (4.3%)	1 (7.7%)	1 (2.2%)
Varisol	17	12	10 (58.8%)	8 (66.6%)	1 (5.9%)	1 (8.3%)	3 (17.6%)	0 (0%)	1 (5.9%)	0 (0%)
Quinine Hydrochloride and Urethane	7	17	6 (85.7%)	13 (76.5%)	0 (0%)	0 (0%)	1 (14.2%)	2 (11.6%)	0 (0%)	0 (0%)
Sodium Morrhuate 5%	49	129	30 (61.2%)	107 (82.9%)	5 (10.0%)	9 (6.8%)	4 (8.9%)	10 (7.8%)	8 (16.3%)	1 (0.8%)
Monolate	85	45	63 (74.1%)	37 (82.2%)	1 (1.2%)	4 (8.9%)	16 (18.8%)	5 (11.1%)	3 (3.5%)	0 (0%)
Ethalate	122	44	95 (77.9%)	39 (88.6%)	3 (2.5%)	3 (6.8%)	10 (8.2%)	2 (4.6%)	2 (1.6%)	0 (0%)

TABLE 2. SUMMARY OF RESULTS COMPARING THE CONVENTIONAL AND "AIR-BLOCK" TECHNICS USING CONVENTIONAL SCLEROSING AGENTS AND SOTRADECOL

		Obliteration			
		Complete	Partial	Reactions	Sloughs
Conventional Sclerosing Agents	Series of 293 Injections Conventional Method	212 (72.3%)	11 (3.7%)	35 (11.9%)	15 (5.4%) (including 4 deep sloughs)
	Series of 293 Injections "Air-Block" Method	241 (82.3%)	23 (7.8%)	23 (7.8%)	2 (0.7%) (no deep sloughs)
Sotradecol	Series of 293 Injections "Air-Block" Method	257 (87.7%)	17 (5.8%)	3 (1.0%)	0 (0%)

dence of complete failure was about one-fourth of the total number of injections when conventional methods were used, and only one-tenth of the number of injections when the air-block method was employed. Since the incidence of local reactions is not appreciably different in the two series, it must be concluded that the local reactions are caused by the chemical character of the sclerosing agent, and that they are not influenced by the type of injection technic. The incidence of sloughing in the air-block series, however, is only one-tenth of that encountered in the conventional series, indicating the safety of the new method.

TABLE 3. COMPARISON OF RESULTS WITH FATTY ACIDS, USING THE CONVENTIONAL AND "AIR-BLOCK" TECHNICS (CONVENTIONAL AGENTS)

	Conventional Method 265 Injections	"Air-Block" Technic 218 Injections
Total dosage	443.05 cc.	360.25 cc.
Dosage per injection	1.63 cc	1.65 cc.
Complete Obliteration	188 (71%)	183 (83.9%)
Partial obliteration	9 (3.4%)	16 (7.3%)
Local reactions	30 (11.3%)	19 (8.7%)
Sloughs	13 (4.9%)	1 (0.5%)

ADVERSE SIDE REACTIONS

There are two classes of adverse side reactions which are particularly disturbing, and militate against the use of sclerosing agents and against the injection therapy of varicose veins in general.

Systemic reactions, which are the most dangerous, occurred only once in the entire series. They can be avoided, or at least considerably decreased, if a minute test dose is given, and if the total amount of injected sclerosing agent is kept at a minimum at each treatment session. This principle was followed successfully, except in one instance of quinine intoxication in a patient apparently sensitive to quinine. By using safe doses of the various agents for one injection, the percentage of complete obliteration resulting from the injection was relatively low when the conventional method was employed. The incidence of failures using the same dose has been reduced greatly in the series in which the air-block technic was employed.

Adverse local reactions are less serious, but they occur more frequently. Some local reaction is associated necessarily with the injection therapy of varicose veins, but if the necrotizing action of the injected agent proceeds beyond the intima through the layers of the vein and surrounding tissue, reactions will be strong. They are due to chemically produced periphlebitis and possibly even to necrosis. The extent to which such reactions

can be restricted to the intima of the vein depends on the chemical nature of the sclerosing agent, on its concentration, on the volume injected, on the state of sensitization, and also on the physiologic state of the vein wall, and the surrounding tissues which are often degenerated due to the pressure to which these tissues have been exposed for a prolonged period of time.

Severe reaction and sloughing naturally may be caused by most of the sclerosing agents if they are allowed to escape into the perivenous space at the time of the injection. Strong sclerosing agents are more likely to cause severe local reactions. It has been emphasized by Hirschman[5] and others that, to avoid these reactions, it is important to reduce the amount of injected solution to the minimum required. The purpose of the air-block is to make this possible. After segmental ligation of varicose veins it has been observed that the vein between the two occluded vein sectors becomes obliterated (Ferguson[6]). The same is true of the vein sector which lies between two segments which have been thrombosed by the injection of a sclerosing agent.

It is well known that a large thrombus is an ideal medium for recanalization. On the other hand, permanent obliteration is much more readily obtained by concretion of the vein wall, the intima of which has been damaged by agents, than by the organization of an excessive thrombus. The distention of the veins after the injection of the sclerosing agent and the subsequent formation of large thrombi can be prevented by the application of firm bandages after treatment. In the few cases in which extensive thrombosis and formation of coagula have occurred, I have obtained good results[7] by evacuation of formed large thrombi, coagula, and stagnant blood through stab incisions and application of pressure bandages afterwards. Usually, concretion of the vein wall and permanent obliteration followed.

The desirability of producing small thrombi, as emphasized by Oehsner,[8] is further motivated by the attempt to avoid thereby embolism which follows massive thrombosis more frequently.

In this connection it is interesting to note that Westerborn[9] reported in 1937 that the mortality incidence among 30,000 injections was 0.03 per cent. Up to that year usually large doses of irritating and toxic agents were used.

Venous obliteration by concretion is aided greatly by simultaneous venous spasm which often occurs after the injection of the sclerosing agent.

One of the most important advantages of the air-block technic becomes apparent if the two last columns of Table No. 1 are compared. The incidence of sloughs has been decreased to less than one-third when De-L-S was used, and to less than one-twentieth when morrhuate was used. The appearance of sloughs practically was eliminated in connection with the use of the other sclerosing agents.

The air-block method offers a valuable safeguard against hazardous paravenous injections. The injection of air preceding the injection of the sclerosing agent produces a subcutaneous emphysema if the needlepoint has not been inserted completely within the lumen of the vein. This emphysema can be seen instantly and clearly, thus serving as a warning to remove the needle and to inject at another site. The appearance of blood in the syringe is not always a certain proof that the needlepoint is completely inside of the vein. It may happen, even with a short beveled needle, that only the distal half of the point is within the lumen and that the proximal half is within the vein wall or outside the vein wall. In this case, blood will appear in the syringe, yet a part of the sclerosing agent may escape into the vein wall or into the surrounding tissue.

In the series in which the air-block technic was used, there was no instance of deep slough. In the other series, however, four cases of deep sloughing occurred, which required more than three weeks for healing.

RESULTS WITH SOTRADECOL

A third series of this study consisted of 293 injections made with a new sclerosing agent —Sotradecol—using the air-block method. Sotradecol (sodium tetradecyl sulfate) was introduced into the sclerotherapy of varicose

veins by Reiner [10] in 1946. This product was selected because experimental studies have shown that it has remarkable thrombogenic activity, combined with a minimum tendency to produce tissue irritation. Cooper [11] and Hirschman [5] tested this agent on a large series of cases, confirmed essentially the conclusions based on pharmacologic observations, and stated that this agent is two to four times as effective as the fatty acid salts. Systemic reactions, cramps, sloughing, skin eruptions, and local reactions occurred less frequently than with other sclerosing agents, according to Cooper, and were practically absent in Hirschman's series, who emphasized the importance of using only small amounts of this solution at any one site of injection.

Thirty-nine injections were made with 1 cc., six injections with 0.75 cc., four with 0.7 cc., three with 0.6 cc., 151 with 0.5 cc., twelve with 0.4 cc., thirty-six with 0.3 cc., forty-one with 0.25 cc. and one injection with 0.15 cc.

It is evident from Table 2 that the percentage of complete obliteration is higher in the Sotradecol series than in the two preceding series in which standard agents were used; it exceeds by 5 per cent the obliteration obtained with the air-block series (with standard solutions) and by 15 per cent the obliteration obtained with the series using the conventional methods (with the same standard solutions).

Local reactions were noted only in 1 per cent in the Sotradecol series as compared with 11.9 per cent and 7.8 per cent in the series in which conventional solutions were employed. There were no sloughs in the Sotradecol series as compared with an incidence of 0.7 per cent in the air-block series with standard solutions and 5.4 per cent in the conventional method-series using standard agents.

Results obtained with Sotradecol are compared with the results from the fatty acid series in Table 4. Complete obliteration was observed with Sotradecol in 87.7 per cent as compared with 83.9 per cent with the standard fatty acid salts. The incidence of local reactions with Sotradecol was 3 (1 per cent) which is one-eighth of that observed with the fatty acids (8.7 per cent). The inflammatory symptoms in the cases of local reactions were minimal. They were distinctly less than seen with other sclerosing agents. Slough was produced in one instance by the injection of fatty acid salts, but no slough occurred in the Sotradecol series. Allergic or other systemic reactions were not encountered. In this connection it may be interesting to note that a patient, suffering from hypersensitivity to adhesive tape, tolerated 3 cc. of Sotradecol administered in 6 injections at three sessions without any symptoms. It is noteworthy that these results were obtained with an average dose of 0.4 cc. of Sotradecol in contrast with 1.7 cc. of the fatty acid salts, notwithstanding the fact that the concentration of the active ingredient in the latter was 5 per cent, whereas that of Sotradecol was only 3 per cent.

TABLE 4. COMPARISON OF RESULTS WITH FATTY ACIDS AND SOTRADECOL, USING THE "AIR-BLOCK" TECHNIC

	Fatty Acid Group	Sotradecol
Number of injections	218	293
Total amount of sclerosing agent used	360.25 cc.	129.75 cc.
Average amount per injection	1.7 cc.	0.4 cc.
Obliterations	183 (83.9%)	257 (87.7%)
Local reactions	19 (8.7%)	3 (1%)
Sloughs	1 (0.5%) (superficial)	0 (0%)

Previous reports on the use of Sotradecol do not give the average dose used, but only the range. It is my opinion that the average dose of Sotradecol was reduced by employing the air-block technic. It is certainly remarkable that the percentage of takes with an average dose of 0.4 cc. Sotradecol is higher than the percentage of takes in the fatty-acids group where the average dose is over 4 times as large (1.7 cc.).

Owing to the fact that the vein sections between two occluded vein sectors undergo secondary obliteration, as previously stated, the number of injections per leg did not have to be increased in the Sotradecol series in spite of the reduced amount of Sotradecol per

single injection. Here as in the other two series, where the average dose of the sclerosing agent was 1.7 cc. as compared with 0.4 cc. in the Sotradecol series, the number of injections per leg varied between 4 and 6.

SUMMARY

A new technic for the injection therapy of varicose veins is described in which the initial dilution of the agent by blood is prevented by the introduction of a small air bubble into the lumen of the vein, immediately preceding the injection of the sclerosing agent. There is no danger of air embolism.

Results tabulated indicate that with the air-block technic a greater incidence of obliteration is obtained than with conventional methods. The method was tested with six sclerosing agents (De-L-S, varisol hydrochloride, quinine and urethane, sodium morrhuate, ethalate and monolate).

The air-block technic was used in testing the efficiency of Sotradecol, a new sclerosing agent, in a small preliminary series of cases. This agent, combined with the new technic, yielded complete obliteration in 87.7 per cent of the injections with an average dose of 0.4 cc. This compares favorably with 83.8 per cent of successful obliterations obtained with an average dose of 1.7 cc. of fatty acid solutions.

There were 15 cases of postinjectional slough in the series of the conventional injection technic, and not one case of slough in the Sotradecol air-block series, demonstrating the advantage of the new method and sclerosing agent to safeguard against paravenous injection.

No systemic or severe local reactions were noted. Mild local reactions were observed in 3 cases.

The importance of minimal thrombosis is stressed, and methods discussed to produce venous obliteration by intima concretion, and not by organization of large thrombi. The secondary removal of excessive coagula and stagnant blood, which sometimes occur during the days following the injection, is recommended as one important step in the perfection of the sclerotherapy of varicose veins.

SUMARIO

En esta tecnica nueva de escleroterapia de las venas varicosas se previene la dilucion inicial del agente esclerosante por la sangre con la introduccion de una bobita de aire en el lumen de la vena. No hay peligro al embolismo.

Este procedimiento da mejores resultados que los metodos convencionales y se uso con seis agentes esclerosantes para determinar su eficcacia. Con el uso del agente esclerosante, sotradecol, esta tecnica produjo la obliteracion completa de las venas en 87.7 por ciento de los casos siendo la dosis .4 cc. En esta serie no se presentaron complicaciones de seriedad. Reacciones locales benignas ocurrieron en 3 casos.

Es importante el remover todos las cuajos que se formen dias despues de la inyeccion para obtener buenos resultados.

RÉSUMÉ

Dans cette nouvelle technique de la sclérothérapie des varices, on évite la dilution initiale de l'agent sclérosant par le sang, en introduisant une petite bulle d'air dans le lumière de la veine immédiatement avant l'injection de l'agent sclérosant. Il n'y a aucun danger d'embolie d'air.

Cette nouvelle méthode donne un plus grand nombre d'obliterations que les méthodes ordinairement employées. On fit emploi de six differents grands sclérosants (De-L-S, Varisol, Quinine, Urethane, Sodium Morrhuate Etalate et Monolate).

L'auteur recommende l'emploi du Sotradecol avec la technique recommandée. Cette méthode donna une oblitération complète dans 87.7% des cas avec une injection moyenne de 4 cc. Cette méthode compare favorablement avec l'emploi d'une dose de 1.7 cc. des solutions d'acide gras. Il n'y eu aucune reaction systémique ou locale serieuse dans tous les cas présentés.

L'importance de trombi minimaux est discuttee. Il est préférable de produire une oblitération veineuse par concrétion de l'intima et non par l'organisation de grand thrombi. L'ablation secondaire de caillots excessifs et de sang stagnant qui parfois sur-

vient après l'injection est recommandée pour le perfectionnement de la sclérotherapie des varices.

RIASSUNTO

Con la nuova technica proposta dall' A. nella terapia sclerosante delle vene varicose, la diluizione iniziale del liquido iniettato viene prevenuta dall' iniezione preliminare di una piccola bolla d'aria nel lume della vena. Il pericolo di un' embolia gassosa non esiste. I risultati riportati dall'A. confermano che con questo metodo la percentuale di obliterazione dell vene e' maggiore che con gli altri metodi. La nuova procedura e' stata istituita con diversi liquidi sclerosanti (De-L-S, Varisol, chinino-uretano, morruato di sodio, etalato e monolato).

In una piccola serie preliminare di casi, l'A. ha usato il Sotradecol, un nuovo agente sclerosante. Un' obliterazione completa e' stata ottenuta con cc. 0,4 nell' 87,7% dei casi: con soluzioni di acidi grassi occorre invece una quantita' media di cc. 1,7, mentre la percentuale di obliterazione scende all' 83,8%.

L'A. non ha notato alcune reazione grave, locale o generale, successiva all' operazione.

Viene sottolineata l'importanza di una trombosi minima delle vene iniettate: vengono inoltre discussi i metodi per conseguire un' obliterazione per concrezione dell'intima e non attraverso un'organizzazione di larghi trombi.

L'A. raccomanda——quale importante fattore nella scleroterapia delle vene varicose—una rimozione secondaria di coaguli troppo estesi e di sangue stagnante qualora cio' si verifichi nei primi giorni dopo l'operazione.

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Pseudocysts of the Pancreas and External Drainage*†

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THE purpose of this article is to report 5 cases of proved pseudocyst of the pancreas of pancreatitic and traumatic origin which were successfully treated by marsupialization and external drainage, and to discuss and evaluate the different surgical technics, particularly internal cystovisceral anastomosis and external drainage, employed in the treatment of these pseudocysts.

Pancreatic cysts, especially pseudocysts, are of infrequent occurrence although encountered often enough to merit some diagnostic and therapeutic consideration. In fact, with growing knowledge of pancreatic lesions, and improving laboratory aids to diagnosis—pancreatic function tests, the reaction and ferment concentration of the pancreatic juice by mecholyl injection (Bauman and Whipple [2]), blood amylase activity tests, and roentgenologic examinations—the number of recorded cysts and pseudocysts are rapidly increasing; so much so, in fact, that preoperative clinical diagnosis is coming to be a matter of some accuracy.

Since 1882, much progress has been made in the diagnosis and operative treatment of cysts and pseudocysts of the pancreas. In that year Gussenbauer's [5] publication on marsupialization and external drainage of the pancreas opened an avenue of approach to a technical field which previously had been entered only on sporadic and rare occasions. Numerous contributions to the technical details of the operation have appeared in the literature in succeeding years, and complete reviews of their development have been recorded. As a result, the subject of pancreatic cysts can be approached today with a clearer conception of the operative technic and with a reasonable chance of accomplishing a surgical cure. Despite widening experience with this surgical problem, however, the incidence of postoperative complications continues high, some of the most distressing being external pancreatic fistulae, chemical enzymatic dermatitis, and irritation and excoriation of the skin. Enzymatic digestion and irritation of the skin occurs all too frequently with marsupialization with resultant drainage of pancreatic juice and consequent development of external pancreatic fistula. Many methods—mechanical, chemical, or surgical fistulovisceral anastomosis—have been employed in an attempt to eradicate the external fistula. To overcome this handicap of external drainage, a new method of internal drainage was devised whereby the pancreatic cyst is anastomosed either to the stomach, duodenum, jejunum, or gallbladder. Jedlika [9] was the first to attempt internal anastomosis (1921). Several interesting reports on the results and various modifications of this new surgical procedure have been made since Jedlika's publication. Thus the subject of cystovisceral internal anastomosis of pancreatic cysts have received increased attention in the surgical literature during recent years. Nevertheless, it has seemed to us that the indications for the use of these major surgical procedures differ considerably, depending upon such factors as the site of origin and pathologic nature of the pancreatic cyst. Even so, it remains apparent that no one of the procedures in use at the present time is adequate for the management of all forms of pancreatic cysts, or for the prevention of various complications. From a consideration of our clinical observations and experiences we believe that the selection of the proper type of operative procedure such as marsupialization and external drainage, internal visceral anastomosis, and total extirpation of the pancreatic cyst is dependent upon many factors. Furthermore, the epithelial lining of the cyst is extremely important in the selection of surgical procedure. It is our opinion and conviction that marsupialization and external drainage (cystodermal anastomosis) is the procedure of choice for pseudocysts of the pancreas. Consequently, this operation has been performed

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on a great many patients without the occurrence of serious complications and with a very satisfactory end result. On the other hand, external drainage is a simple procedure which can be performed in a rather short time with minimal tissue trauma or risk. We must not lose sight of the fact that internal visceral anastomosis of the pancreatic cysts, in addition to its rather complicated operative technic, involves more disadvantages and serious complications in the follow-up period such as secondary contamination and suppurative infection of the cystic cavity, secondary perforation and hemorrhage to the gastrointestinal tract due to enzymatic digestion of the cystic walls. This is particularly true in pseudocyst of the pancreas. For this reason, notwithstanding the fact that this new method (internal anastomosis) has produced spectacular results in the treatment of other types of pancreatic cysts (true cysts), it has been found wanting and impractical in the treatment of pseudocysts. This failure is due to the inherent nature of pseudocysts. Many hopes have been raised with the advent of this new surgical method but have met with disappointment, owing to lack of appreciation of the differences existing between the various pathologic characters of true pancreatic cysts and pseudocysts, as well as the specialized problems involved in the operative cure of pseudocyst. It is evident that rational therapy can be administered only when the pathologic character of the condition is appreciated. Characteristically, pseudocysts of the pancreas have no proper wall, no epithelial lining, are bounded by the peritoneum of the omental sac and adjacent organs, originate practically always as a result of pancreatic necrosis or trauma, and contain fluid consisting of a mixture of disorganized pancreatic slough and inflammatory exudate, often some more or less altered blood, and sometimes considerable amounts of pancreatic ferments. Furthermore, surgical eradication, that is, total extirpation of pancreatic pseudocysts, creates the difficult problem of promoting healing in absence of a proper wall. Consequently, the rational surgical method and successful procedure of choice for the treatment of pseudocyst would seem to be marsupialization and external drainage.

A distinct advantage of external drainage is the reduction of the opportunity for secondary contamination of the cystic cavity and possibility of secondary hemorrhage and enzymatic activity.

With the discovery of new pancreatic function tests, and with new pathogenetic and therapeutic concepts, the subject of pancreatic cysts and pseudocyst has received increased attention in the surgical literature during recent years. However, cysts and pseudocysts of the pancreas have been reported and discussed in the medico-surgical literature since 1830.

HISTORY AND INCIDENCE

In 1842 Claessen was able to collect a number of individual case reports from the literature. Virchow and Klebs described autopsy findings, and Friedrich, in 1878, pointed out that the clinical diagnosis of pancreatic cysts was very difficult and the treatment symptomatic and dietary. Körte [13] stated that the literature revealed 177 cases of pancreatic cysts up to 1902. Guleke made a complete survey of all reported cases in the literature between 1882 and 1911 and found reports of 260 operated cases. Heinrich Muller reviewed the literature on pancreatic cysts and found an additional 196 case reports between 1912 and 1929. Shmieden and Sibening, in 1927, reviewed 127 cases of pancreatic cysts. Walter and Cleveland cite Thigpen's review of 139 cases treated surgically at the Mayo Clinic between 1908 and 1939. Walter, Puestov, and McCaughn stated that the incidence of pancreatic cysts was 1 in 8000 admissions to the latter institution. A review of the accumulated clinical records revealed that this diagnosis has been made in only 9 cases since the origin of the Lahey Clinic from 1926 to 1945 (Ralph Adams and Randal A. Nishijima). In a general review of pancreatic cysts it was found that the average incidence of pancreatic pseudocysts was 40 per cent of all pancreatic cysts. In our clinical records there were only 5 cases of pseudocysts in 14,000 clinical admissions between 1938 and 1946.

CLASSIFICATION OF CLINICAL TYPES

Judged by the medical literature, the classification of pancreatic cysts is varied and extensive.

I. Classification of Archibald Adams and Ralph Adams:
   1. Adenocystomas
   2. Retention cysts
   3. Degeneration cysts
   4. Pseudocysts

II. Classification of Oser as modified by McWhorter:
   1. Retention cysts
      A. Chronic indurated pancreatitis
      B. Compression of the duct from without
      C. Obstruction of the duct from within (calculi, parasites, catarrhal inflammation)
   2. Cystic neoplasms (proliferative type)
      A. Congenital
         a. Dermoid cyst
         b. Congenital cystic disease
         c. Teratoma
         d. Fetal adenoma
         e. Mixed tumor
      B. Acquired
         a. Cystadenoma
         b. Epithelioma cystica
   3. Pseudocysts (cysts resulting from hemorrhage, degeneration, or necrosis)
      A. Intrapancreatic
         a. Degeneration tumors, sarcoma, carcinomas, etc.
         b. Trauma
         c. Vascular disease
         d. Pancreatitis
      B. Extrapancreatic (caused by same factors as in the intrapancreatic pseudocysts)
   4. Pancreatic cysts—echinococcus

III. Robson and Cammidge classification:
   1. Retention cysts
   2. Proliferation cysts
   3. Congenital cysts
   4. Hemorrhagic cysts (secondary to necrosis and bleeding)
   5. Hydatid cysts
   6. Pseudocysts
   7. Dermoid cysts

IV. Kaufmann classification:
   1. Cystic adenoma and Lymphangioma (so-called proliferation cysts)
   2. Dysontogenetic cysts (Wegelin, Yamane)—congenital cystic disease of the pancreas. Solitary cystic pancreas or very rarely associated with cystic liver (Verf. Glang, Hennicke, v. Meyenburg, Yamane) and cystic kidney.
   3. Acquired true cysts—retention cysts, true glandular cysts
   4. Cystoids or pseudocysts

V. Körte's classification:
   1. True glandular cysts of the pancreas
      Anatomic and surgical classification
      a. Uni- or multilocular macrocysts
      b. Polycystic tumors
      Histologic classification
      a. Canalicular cysts—retention cysts of secretory ducts and canaliculae, or ranula pancreatica Virchow
      b. Proliferation cysts — cystoma glandulare proliferum (according to Lazarus, these are most frequent forms)
   2. Pseudocysts or cystoids

The foregoing review affords evidence that a considerable similarity exists between the classifications of various authors. Körte's classification, however, possesses definite advantages not only from the clinical and pathologic but also from the surgical standpoint. It emphasizes clinical, pathologic, and surgical distinctions between true glandular pancreatic cysts and pseudocysts. Körte's data, with some modification and consideration, give the following classification of pancreatic cysts:

1. True glandular cysts. These forms are true glandular cysts arising from the parenchymal cells of the pancreas by proliferation, or secretory canaliculae by obstructive and inflammatory process and are therefore glandular structures lined with epithelium and with a proper wall.

A. Retention cysts (canalicular cysts Körte, ranula pancreatica Virchow, acne pancreatica or multiple cysts of the pancreas Klebs) which usually are small cysts lined

with epithelium of cuboidal excretory type. The pathogenesis still is not entirely clear but it has been observed that they are caused by obstruction such as tumor, calculus, or scar in the pancreatic duct, smaller ducts, or acini, and are associated with a sclerotic process in the pancreas. As the result of investigations by Dieckhoff, Tilger, and Speese it is assumed that the cause lies in chronic interstitial pancreatitis, but pathologically this may be interpreted as the result of the condition, rather than its cause. The experimental results from ligation of the main duct and injection of tincture of iodine into the pancreatic substance with stagnation and sclerosis (Lazarus) may explain the development of retention cysts in man.

B. Blastogenic cysts, cystic tumors, cystic neoplastic formations. The term is employed here to designate the larger group of cysts to be considered in the general category of benign tumors of as yet undetermined etiology. These are true tumors arising from the parenchymal cells by proliferation and possess therefore typical glandular structure. They are lined with cuboidal or cylindrical epithelium, are frequently multilocular, and do not contain pancreatic ferments. They are of comparatively infrequent occurrence.

a. Congenital cysts: (a) Dermoid cysts (Guleke); (b) Congenital cystic disease—dysontogenetic cysts (Kaufmann, Wegelin, Yamane) as part of a developmental disturbance involving other organs (liver, kidney); also congenital cysts of the pancreas without developmental disturbance elsewhere. (c) Teratomas; (d) Fetal adenomas; (e) Mixed tumors.

b. Acquired forms: (a) Cystadenoma, adenocystoma, proliferation cysts (Körte), cystoma glandulare proliferum. These are frequently compared with the adenocystomas of the ovary. (b) Cystepithelioma, epithelioma cystica, true glandular cystic tumor formations.

2. Parasitic cysts (echinococcus or hydatids).

3. Pseudocysts. These designate the accumulation of fluid that is produced by trauma, necrosis (pancreatic) or degenerative changes in the interstitial tissue of the pancreas. From the pathologic standpoint, pseudocyst may be subdivided into two fundamentally different classes:

A. Degeneration cysts. These present the softening and cystic formation of destroyed tissue in the pancreas. Most frequently, they are an end result of acute pancreatic necrosis by the liquefaction of the dead pancreatic tissue, or of the autodigestion of effused blood. They may also develop as the result of toxic or infective lesions such as may occur in typhoid or general sepsis as well as from the softening of cancer or sarcoma (Lazarus). There is no sharp line of demarcation between the degeneration cysts and pseudocysts. At least the two classes overlap. Between these and the pseudocysts there is a difference only of anatomic situation, the degeneration cysts being mostly intrapancreatic, and the pseudocysts juxta or prepancreatic.

B. Posttraumatic or postpancreatitic cystoids or pseudocysts are juxta- or prepancreatic. We agree with Körte that the largest number of pancreatic cysts coming to operation belong to this group. These are distinguished from the true glandular and degenerative cysts by their anatomic situation being outside the substance of the pancreas and usually in the lesser omental sac. They have neither proper wall nor epithelial lining; their wall is constituted by the peritoneal boundary of the omental sac and by adjacent organs. The cystic contents consist in part of more or less disorganized and liquefied necrotic self-digested pancreatic tissue, in part of inflammatory exudate (Cases 1, 5), and often more or less altered blood (Cases 2, 3, 4). The cystic contents, therefore, may be only slightly turbid and serous (Cases 1, 5), yellowish, brownish-green (Cases 2, 4) or even blackish. In one case (Bruère), the fluid gave a definite reaction for bile although hematoidin crystals pointing to hemorrhage give the same reaction. This observation suggests the action of bile in causing the original lesion which led to cyst. As to pancreatic ferments, it is possible to find small amounts of pancreatic ferments in any cyst which has been accompanied by hemorrhage. Diastase has slight diagnostic

significance, lipase has somewhat greater value while if trypsin is found it is fair to assume a pancreatic origin. It should be noted that the content of the pseudocyst has a markedly increased ferment activity. This fact has been proved in our clinical cases, but it is of slight diagnostic significance in distinguishing true cysts from pseudocysts.

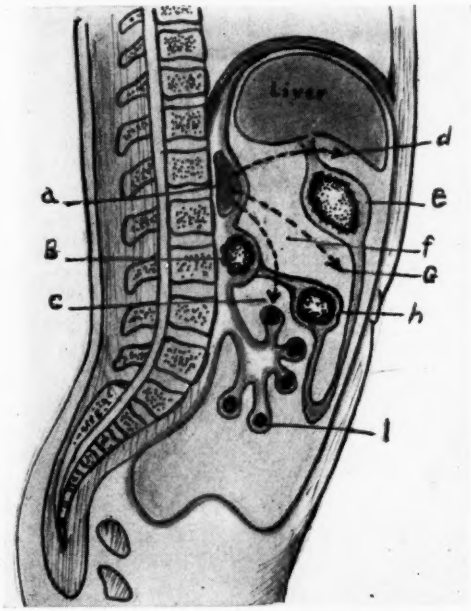

Fig. 1. Sagittal section through the body of the pancreas illustrating the various possibilities for the formation of pseudocysts: a, pancreas; b, duodenum; c, inframesocolic species; d, gastrohepatic species; e, stomach; f, lesser sac; g, gastrocolic species; h, transverse colon; i, small intestine.

ANATOMIC CONSIDERATIONS

The pancreas lies in the epigastrium and left hypochondrium in a retroperitoneal position behind the serosal floor of the lesser omental sac, at the level of the first and second lumbar vertebrae. It is bounded posteriorly by the nonresilient posterior abdominal wall, and for this reason lesions of the pancreas are likely to extend forward in the direction of least resistance and generally into the lesser sac. A diagrammatic sagittal section through the body of the pancreas demonstrates clearly the various locations in which a pancreatic cystoid may be found (Fig. 1).

The three most common locations occupied by pancreatic cysts and pseudocysts in order of frequency are listed according to Lazarus, and Judd, Matson and Mahorner.[10]

1. Cyst presenting between the stomach and transverse colon and behind gastrocolic ligament (species gastrocolica Lazarus, supramesocolic or gastrocolic location).

2. Cystic growth may take place upward, presenting between the stomach and liver under the gastrohepatic omentum (species gastrohepatica Lazarus).

3. Cyst lying between the layers of the transverse mesocolon either behind the transverse colon or below it (species mesocolica or infracolica Lazarus). Very rarely these cysts may assume a position behind the descending colon, and may even descend into the pelvis. In our series the pancreatic pseudocysts presented the most common locations of the cysts between the stomach and transverse colon and behind the gastrocolic ligament (gastrocolic species of Lazarus).

ETIOLOGY AND PATHOGENESIS

Pancreatic cysts, especially pseudocysts, have been observed at all ages but most frequently in patients in middle life. One case, however, in a five months old child, was reported by Eha.[4] Traumatic cysts occur predominantly in the male presumably because he is more often exposed to trauma. In the present series of 5 cases there were 4 males and 1 female. The youngest was 16, and the oldest 35 years of age (Table 1).

TABLE 1

Case	Sex	Age	Type of Pseudocyst Cyst
1	Male	16	Traumatic
2	Male	26	"
3	Male	35	Postpancreatitic
4	Male	23	"
5	Female	27	"

The most frequent cause of pseudocyst formation is a preceding attack of acute or

subacute pancreatic necrosis (hemorrhagic pancreatitis, postpancreatitic pseudocyst), or the condition may follow posttraumatic acute and subacute hemorrhagic pancreatitis due to isolated open injury or solitary contusion of the pancreas (posttraumatic pseudocysts). The great majority of pseudocysts follow acute pancreatic necrosis. Posttraumatic cysts make up from one-third to one-fourth of all pancreatic cysts. According to Mickuliez in pseudocysts there is a traumatic origin in 25 per cent. In Körte's series of 129 cases 33, or 27 per cent, were traumatic pseudocysts. Lazarus gives a posttraumatic origin of 30 per cent, and Goebell in 33 per cent. In Schmieden's total 128 cases 16 were due to trauma, 28 to pancreatitis, 11 to tumor, and in 73 the cause was unknown or unrecorded. Honigman, in 1905, was able to collect 69 posttraumatic pseudocysts from the literature. Between 1905 and 1933 134 new cases were added to this total. Considering recently published cases, the number of traumatic pseudocysts recorded in the literature is about 215. Of our 5 cases 2 were of posttraumatic and 3 of postpancreatitic origin.

The classic paper by Jordan Lloyd describes the pathology and pathogenetic mechanism of posttraumatic pancreatic pseudocyst so well that one cannot do better than quote him. "A blow in the upper part of the abdomen especially in the epigastrium may crush the pancreas against the first and second vertebrae, its serosal covering being thin, may be easily torn through, and bleeding will then take place under the parietal peritoneum (hematocele), or into the lesser sac, where the resulting fluid collects (pseudocyst)." Nevertheless, it is a fact that posttraumatic pseudocysts have been associated most frequently with an acute hemorrhagic pancreatitis and have been developed following traumatic acute or subacute pancreatic necrosis. Under these circumstances one must accept the autodigestive role of activated trypsin and enzymatic activity of the pancreatic juice (lipase) due to injury and tearing of the pancreatic acini, lobules or secretory ducts (Case 2).

It is evident that while every injury to the pancreas does not lead to a pseudocyst, many of them do. This is also the case with open wounds which are rarer than the subcutaneous contusions. While many of the patients survive because the exudate becomes localized, others lose theirs through a rapid spread of necrosis in the organ.

In the earlier literature, trauma was frequently mentioned as the etiologic agent in the production of pseudocysts. But in most of the pancreatic pseudocysts it is not possible to find preceding upperabdominal trauma as an etiologic factor. Körte and Quenue first classified the pathogenesis of nontraumatic pseudocysts, demonstrating the important causative role played by partial necrosis of the glandular tissue. More recently emphasis has been placed on the role of acute and subacute hemorrhagic or edematous, that is, exudative, pancreatitis as the etiologic agent.

The pathogenesis is still undecided. It has been suggested that partial obstruction of the pancreatic ducts may lead to necrosis. There is ample evidence to prove that cholecystitis and acute and chronic pancreatitis coexist in a large percentage of cases. But the cause of such coexistence is still obscure and the source of the provocative agent is unknown. Lecène, Dragstedt, Haymond, and Ellis have shown that in 60 per cent of the cases of acute hemorrhagic pancreatitis, there was antecedent biliary tract disease. "In 3 of our cases of pseudocysts of pancreatitic origin, there was no previous history of biliary tract diseases." In 10 per cent of these, a common channel was produced by the impaction of gallstone in the ampulla of Vater; in the majority of the remainder a common channel was produced by spasm of the sphincter of Oddi, or edema of the papilla. Thus a study of the literature makes it apparent that, both "the common channel theory of bile reflux, and the obstructive theory with its concommitant concentration of the alkaline pancreatic juices within the pancreas" are both tenable theories as to the production of acute pancreatitis. Among many explanations of the cause of pancreatitis the "common channel theory" seemed most plausible to the greatest number of clinicians until Rich and Duff, seeking the cause of acute hemorrhagic pancreatitis in cases in which there was no

ampulla of Vater, conclusively demonstrated that in some cases acute hemorrhagic pancreatitis is due to metaplasia of the epithelium of the duct with associated dilatation of the duct and acinar rupture behind the obstructing metaplasia.

Current theories postulate that bile entering the pancreatic duct in man produces necrosis of the pancreas because of its own irritating and necrotizing properties or bacterial content (Brunschwig), or because it activates the inactive trypsinogen of the normal pancreatic secretion while the latter is still in the pancreatic ducts. Person and Brunschwig, who emphasize the role of infection introduced by the reflux of bile content say that necrosis of the pancreas is produced either through the direct action of the bacteria or through the destructive effect of trypsin which follows on the activation of trypsinogen by bacteria or their products.

All authors agree that the peculiar characteristic of the necrosis which accompanies hemorrhagic pancreatitis depends on the action of pancreatic lipase which is secreted in active form and which escapes into the tissues when necrosis of the pancreas occurs. Some authors believe that the hemorrhage of acute hemorrhagic pancreatitis is the result of a vasomotor reflex due to "local anaphylaxy-tissue allergy" (Bergeton, Couvelaire 1933, Gregoire, Schweitzer, Silvestri 1935). Others believe that it results from venous thrombosis (Chabrol-Gilbert) and still others that it results from erosion of the blood vessels by pancreatic trypsin (v. Bergmann, Guleke). Rich and Duff, and Lepine found that the specific vascular lesion causing the hemorrhage was located in the media of the vessel. This process apparently is a rapid one and quickly involves the entire thickness of the vessel wall with a final destruction of the intima. The lesion is quite distinguishable from that characteristic of the familiar arteriosclerosis.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

The diagnosis of pseudocysts usually is made from a close consideration of the physical findings and the history, evaluation of the pancreatic function tests and other laboratory and x-ray findings. Clinical symptomatology and the elements of diagnosis have been detailed and mentioned in the records of our reported cases. For this reason, we will only review the most important clinical signs from the standpoint of diagnosis.

Pain is the most frequent and constant symptom at the onset, a fact which indicates the large share which acute or subacute pancreatitis has in causation of pseudocysts of traumatic or pancreatitic origin. Pain usually is located in the upper part of the abdomen, especially in the epigastrium, and extends to the back, left shoulder and shoulder blade. It is due to irritation of the solar plexus and as a rule has the character of severe repeated painful attacks of celiac neuralgia. Usually it is associated with nausea, vomiting and sometimes hiccups. The initial painful attack disappears for a time, reappearing only when the cyst has grown to such a size as to cause distention. During the period of gradual formation of the cyst the patients complain only of indefinite symptoms, chiefly gastric distress, or loss of appetite and a feeling of weight in the epigastrium. Frequently the only evidence may be symptoms of pressure on the neighboring organs, especially on the stomach, with anorexia and epigastric discomfort after meals which may be accompanied by nausea, vomiting, gaseous distention and diarrhea. Rapid loss of weight also is often observed and is considered characteristic of pancreatic cyst by Payr. Slight evidence of internal and external secretory insufficiency of pancreas may be present (pancreatic indigestion and diabetes). Coprologic examination, blood, and urine sugar and glucose tolerance tests should be done. The period of growth of traumatic pseudocysts usually is from 8 or 10 days though it may be three to four weeks (Case 1, 4 days; Case 2, 19 days) until it becomes obvious to examination. In cases following acute pancreatitis this period may be from one week up to several weeks or months (Table 2). The presence of a smooth, tense, immobile (except when located in the tail of the pancreas) abdominal mass situated above the level of the umbilicus in the upper and middle abdomen is the most helpful and reliable diag-

TABLE 2

Case	Type of Cyst	Interval Between Causative Factor and Cyst Formation	Clinical Findings	Complications
1	Traumatic pseudocyst	4 days	Solar syndrome.* Large cystic mass in upper part of the abdomen (epigastrium and left hypochondrium), hypochromic anemia	—
2	"	19 days	Solar syndrome with acute hemorrhagic pancreatitis, deep shock, peritoneal manifestations, anemia, large cystic mass in the epigastrium and left hypochondrium	Spontaneous rupture into the gastrointestinal tract (duodenum and transv. colon), severe repeated hemorrhage (hematemesis, melena) colisepsis
3	Postpancreatitic pseudocyst	2 days	Solar syndrome with fever, secondary anemia, large cystic mass in the epigastrium and upper part of the abdomen	—
4	"	45 days	Solar syndrome, fever, gastro-intestinal disorders, large cystic mass in the epigastrium and the upper half of the abdomen	—
5	"	2 months	Solar syndrome, large cystic mass in the left hypochondrium	—

* Pain, nausea, vomiting.

nostic sign. Pulsation is found frequently in these, being communicated from the aorta.

Roentgenologic Examination. Roentgenography is a major aid in the diagnosis of pseudocysts of the pancreas. The presence of an enlarged duodenal loop, or a filling defect of the stomach, hour-glass stomach, displacement of the stomach and transverse colon due to extrinsic pressure, low-lying position of the transverse colon and splenic flexure, supports accurate diagnosis of a pancreatic pseudocyst.

Function Tests. One of the very important tests in the diagnosis of pseudocysts is the blood and urine amylase activity test (Pinkham,[15] David Polowe [16]). Pinkham, in a review and analysis of 10 cases of pancreatic pseudocysts, states that "Persistent elevation of the serum amylase following the signs and symptoms of pancreatitis is significant, indicating the probable development of a pancreatic collection."

It is evident that the blood amylase activity determinations remain as a definitely valuable aid in the diagnosis of acute pancreatitis and pancreatic pseudocyst (Case 1, 8 plus; Case 2, 2 plus; Case 3, 4 plus).

The reaction and ferment concentration of the pancreatic juice after the injection of mecholyl indicates that a test of the external function of the pancreas may well become an important procedure in the diagnosis of pseu-

TABLE 3

Case	Cyst Type by Cause	Anatomic Type	Laboratory Findings									Roentgenologic Findings
			Sugar		Feces: undigested fat muscle fibers	Secondary Anemia	Leukocytosis	Weinberg	Casoni	Blood Amylase Activity	Urine Amylase Activity	
			Urine	Blood								
1	Traumatic pseudocyst	Gastrocolic species (supramesocolic species)	3 gr.	107 mg.	+	+	—	—	—	256 u	512 u	Filling defect of the stomach. Extrinsic pressure and displacement of the stomach and transverse colon
2	"	"	—	123 mg.	+	+	+	—	—	64 u	128 u	"
3	Pseudocyst due to acute hem. pancreatitis	"	—	N	+	+	—	—	—	128 u	64 u	"
4	"	"	—	N	—	—	—	—	—	—	—	"
5	"	"	—	N	—	—	—	—	—	128 u	—	Extrinsic pressure and low lying position of transverse colon. No filling defect on the stomach

docysts and biliary tract diseases. Diagnostic aspiration of the cyst is not advisable. An exploratory laparotomy is almost as simple and much safer.

Differentially, pancreatic pseudocysts must be distinguished from omental or mesenteric cysts, hydronephrosis or cysts of the kidney, retroperitoneal tumors, ovarian cysts, and cysts or tumors of the liver and spleen.

COMPLICATIONS

Occasionally a pseudocyst may rupture spontaneously into the stomach or intestinal tract, especially into the transverse colon and which is suggested by the evacuation from stomach or rectum of a quantity of cyst contents. This complication occurred in our Case 2 which subsequently developed a fatal sepsis and hemorrhage. On the other hand, the rupture may occur into the peritoneal cavity and death from peritonitis may ensue. In a few cases the original pathologic process, chiefly acute pancreatitis or trauma, may have caused such extensive destruction of the glandular tissue that diabetes may gradually develop, rendering the prognosis decidedly unfavorable. Rapid death has been reported in a few cases from the erosion of vessels in the wall of the cyst with consequent massive hemorrhage.

TREATMENT

Previous clinicopathologic studies have shown that the treatment of pseudocysts is definitely one of surgery alone. Three different procedures may be considered:

1. Total excision or radical extirpation.
2. External drainage by marsupialization.
3. Internal drainage, or cystovisceral anastomosis.

Radical complete extirpation is the ideal surgical procedure for true glandular cysts of the pancreas. Unfortunately complete extirpation is not always feasible because of the intimate relationship and dense adhesion of the cyst to the surrounding structures. Other risks which frequently make extirpation dangerous are hemorrhage, the possibility of producing acute pancreatic necrosis or diabetes mellitus or of causing intolerable injury to the intestinal blood supply. Also, the mortality of total extirpation is considerably higher than that of other procedures. According to Heinz-George Rössing, the mortality of radical extirpation is 10.7 per cent. In Guleke's 21 cases it was 9.5 per cent. Therefore, attempts at radical extirpation must be strictly limited to true cysts which can be extirpated, in which case the operation may be undertaken either primarily, when the cyst is small and can be seen to originate probably from a tumor in the pancreatic substance, or secondarily, after marsupialization when the fistula refuses to heal after prolonged drainage.

It is obvious that radical extirpation is neither practical nor advisable in the case of pancreatic pseudocysts since pseudocysts have no proper wall or line of cleavage separating them from the surrounding structures. They are intimately adherent to the surrounding tissues and neighboring organs. External drainage by marsupialization (cystodermal external anastomosis) has become the operation of choice in treating pseudocysts surgically from its suggestion by Gussenbauer in 1882 up to the present time (Table 4). It has been performed in a great many cases without serious complications and with very satisfactory end results. Furthermore, external drainage is a simple and much safer procedure which can be performed in a rather short time with minimal tissue trauma. In the present series the pseudocysts have disappeared rapidly under external drainage and eventually have been closed very satisfactorily. Schmieden, in 1927, reported a series of 95 cases of pancreatic cysts treated by the same procedure and with the same results.

On the other hand, external drainage by marsupialization has not been entirely satisfactory in the surgical treatment of true pancreatic cysts owing to the formation of an external fistula which may persist and drain for a prolonged period. Kehr, and Judd, Mattson and Mahorner reported drainage persisting from a few weeks to two or more years. Other authors have had the same experience. Other complications also may occur, such as excoriation of the skin by the enzymatic activity of the discharge, infection of the

TABLE 4

Case	Type of Cyst	Operative Procedure	Approach	Duration of Drainage	Complication	Cyst Content
1	Traumatic pseudocyst	Marsupialization. Aspiration of cystic content, without drainage	Through the gastrocolic ligament	—	—	2 liters, serous, cloudy exudate. High amylase activity
2	"	—	—	—	Spontaneous rupture into the duodenum and transverse colon, hemorrhages, general sepsis, death	—
3	Postpancreatitic pseudocyst	External drainage by marsupialization	Through the gastrocolic ligament	3 weeks	—	2.5 liters light coffee-colored fluid, 3 ferments of the pancreas, high amylase activity
4	"	"	"	3 weeks	—	2 liters brown bloody fluid, high amylase activity
5	"	"	"	16 days	—	1 liter white, cloudy fluid, high amylase activity

cyst, and sinus and formation of a secondary suppurative process in the cystic cavity. Many methods have been attempted to eradicate the fistula. Wholgemuth advised an antidiabetic diet; Culler [3] used roentgen irradiation; Hamilton [7] used radium; others have treated the direct source and attempted to destroy the lining membrane of the pancreatic cyst, either mechanically or chemically. Schwyzer applied tincture of iodine to the interior of the cystic cavity. Gordin used a sclerosing agent to destroy the membranes of the cyst. Doyen dissected out the fistulous track and implanted this track into the stomach or small intestine. This procedure (fistulovisceral anastomosis) has also been performed by others with considerable success.

To overcome the handicap of external drainage Jedlika suggested "primary internal drainage or cystovisceral anastomosis" in 1921. By this method the cyst is anastomosed either to the stomach, duodenum, jejunum, or even the gallbladder. He resected a major portion of the cyst and implanted the remainder of the cyst into the posterior wall of the stomach. Others have followed him by implanting a fistula into the stomach or effecting a cystogastrostomy. Vecche and Jurasz [11] modified Jedlika's posterior cystogastrostomy, performing an anterior cystogastric anastomosis. Kerschner, in 1929, reported cystoduodenal anastomosis. Hahn,[6] in 1927 and Chesterman anastomosed the cyst to the jejunum (pancreatocystojejunostomy or enterostomy). Some surgeons have objected to an anastomosis between pancreatic cyst and the gastrointestinal tract, in the belief that the intestinal contents may enter and lead either to secondary suppuration or to an activation of the enzymes in true pancreatic cysts. They

depended on the resorptive power of the gallbladder to remove the fluids produced by the cyst. Hammesfahr [8] and Walzel [17] performed a primary anastomosis between the cyst and the gallbladder (cystovesicular anastomosis, pancreatocystocholecystostomy) and the cystic duct was ligated to prevent reflux of bile. The reason for this ligation is difficult to understand. Neuffer [14] and Achmatowicz [1] performed a similar operation without ligation of the cystic duct. A variety of similar procedures have been performed since, each surgeon making his own modification or form of anastomosis.

CASE REPORTS

Case 1. S. H. C., a white, unmarried male aged 16, a farmer by occupation, came to the clinic on July 24, 1944, complaining of an abdominal mass in the upper left quadrant of the abdomen and of intermittent severe gnawing pain over the same region for the past 3 weeks. Three weeks prior to admission a horse kicked the patient in the upper abdomen. Following the accident severe sharp gnawing pain developed in the epigastrium and upper left part of the abdomen, accompanied by nausea and vomiting. Four days later he noticed a mass in the same area which steadily increased in size. Four or five days before admission he began to have violent attacks of pain and considerable increase in size of the abdominal mass. The antecedent history was noncontributory.

Physical examination showed a large smooth, slightly mobile cystic mass which moved slightly with respiration and which filled the upper abdomen, especially the epigastrium and left hypochondrium, extending about 3 or 4 cm. below the umbilicus. Careful palpation disclosed that the stomach was situated in front of this cystic mass and the transverse colon beneath it.

Laboratory Studies. The urine was yellow, clear, albumin- and acetone-negative, spec. grav. 1025, sugar 3 gr. per liter. *Glucose tolerance* was within normal limits but the blood sugar was 107 mg. per cent in the morning. *Stools* showed no blood or parasites but there were many fat globules and fatty acid crystals, with undigested muscle fibers and starches. The *blood* count showed a definite hypochromic anemia with 3,600,000 red blood cells, 7,400 white blood cells, hemoglobin 60 per cent, color index 83 per cent. Blood amylase test: 38/30′:256—W. U. Urine amylase test: 38/30′:512—W. U.

Fluoroscopic and x-ray examination, after barium meal and enema, showed an extrinsic pressure defect in the stomach between the antrum and fundus, along the great curvature. Lateral film showed the stomach to be displaced by an extragastric mass, lying along the lesser curvature and the posterior wall of the stomach. Barium enema revealed the hepatic and splenic flexures and transverse colon to be particularly low lying due to pressure from the mass (Fig. 2).

The preoperative diagnosis was typical pseudocyst of the body of the pancreas due to traumatic injury.

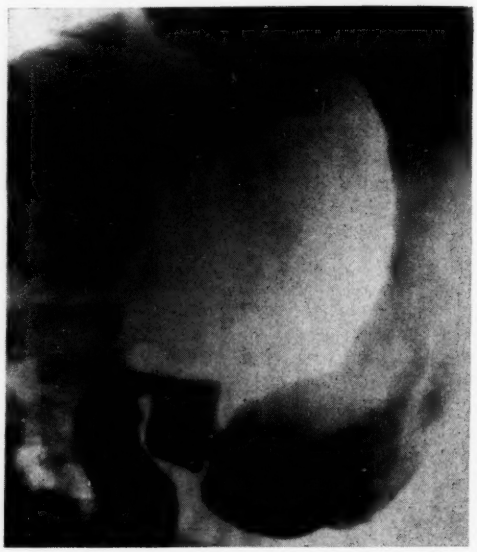

Fig. 2. Case 1, traumatic pseudocyst, gastrocolic species.

After blood transfusion, glucose and saline infusions the patient was taken to surgery on July 31, 1944. Operation was performed by Prof. B. Toker under ether anesthesia and through a supraumbilical midline incision. On entering the abdominal cavity a large cystic mass the size of a human head was palpated behind the stomach and gastrocolic ligament. The approach was made through the gastrocolic ligament; a large cyst adherent to the posterior wall of the stomach and mesocolon was found projecting from the body of the pancreas. Two liters of white cloudy fluid was obtained from the cyst. The wall of the cyst was marsupialized to the peritoneal surface of the anterior abdominal wall without drainage. Laparotomy incision was closed with white silk and catgut.

Fluid removed from the pancreatic cyst was smoky and contained many red blood cells. Amylase test gave high amylase activity.

Postoperative course was normal. Forty-eight hours after operation an attempt was made to open the cyst through the marsupialized wall, but the cyst had completely disappeared. There was no cystic cavity. The patient was discharged Aug. 26, 1944, with complete relief of symptoms.

Case 2. H. F. F., a white male of 26 years, was admitted to the clinic Dec. 19, 1943, with complaint of soreness and severe attacks of colicky pain over the epigastrium and left upper abdomen accompanied by nausea, vomiting and singultus.

Fig. 3. Case 2, traumatic pseudocyst of the pancreas, gastrocolic species, filling defect in the stomach.

The present illness began suddenly 19 days before admission following blunt traumatic contusion in the midepigastric area (a kick during a fight). There had been severe shock lasting 15 minutes associated with deep fainting and pale, cold, clammy skin and profuse perspiration. Following this, a violent sharp gnawing pain developed in the epigastrium and upper part of the abdomen. The pain radiated to the back and to the left shoulder. The patient awakened during the night with excruciating pain in the abdomen not relieved by morphine. The pain continued, becoming increasingly severe the next day, and was followed by continuous nausea, vomiting, and hiccups. Evidences of shock developed, associated with high temperature, vasomotor collapse and profuse diaphoresis. His general state became progressively worse. At that time there was some tenderness and marked rigidity over the abdomen with gaseous distention of the large and small intestine, accompanied by gaseous and fecal retention. Following a consultation the patient was sent to a private hospital for observation. No operation was performed. He was treated conservatively but with no apparent improvement, the symptoms continuing unabated. The patient was transferred to our clinic 19 days after the onset of his illness.

Fig. 4. Case 2, remarkable extrinsic pressure on the stomach.

Physical Examination. The patient was critically ill with profound anemia and pallor. Temperature was 102.2 degrees F., pulse 146, regular, feeble and respiratory rate between 24 to 32 per minute. Blood pressure was normal. The patient suffered several paroxysmal attacks of epigastric pain associated with severe, persistent vomiting, nausea, and hiccups. This was relieved to some extent by lying flat without a pillow. The urine was dark yellow and bowel function was regular, except for occasional attacks of soapy diarrhea. The abdomen was soft and distended with no rigidity, but rebound tenderness was present on pressure over the epigastrium and upper left quadrant. In the epigastrium and left hypochondrium

there was a large, smooth, tense cystic mass about the size of a child's head which protruded slightly above the abdominal contour. It was extended to about the level of the umbilicus. Palpation and percussion revealed displacement of the stomach to the left in front of this cystic mass and there was evidence that the transverse colon was under of the pancreas and confirmed the clinical diagnosis.

Roentgenologic Examination. A flat plate of the abdomen revealed gaseous distention of the large intestine and evidence of pressure of the transverse colon and hepatic flexure and displacement of the stomach due to extrinsic pressure. Roentgenograms taken after a barium meal and barium

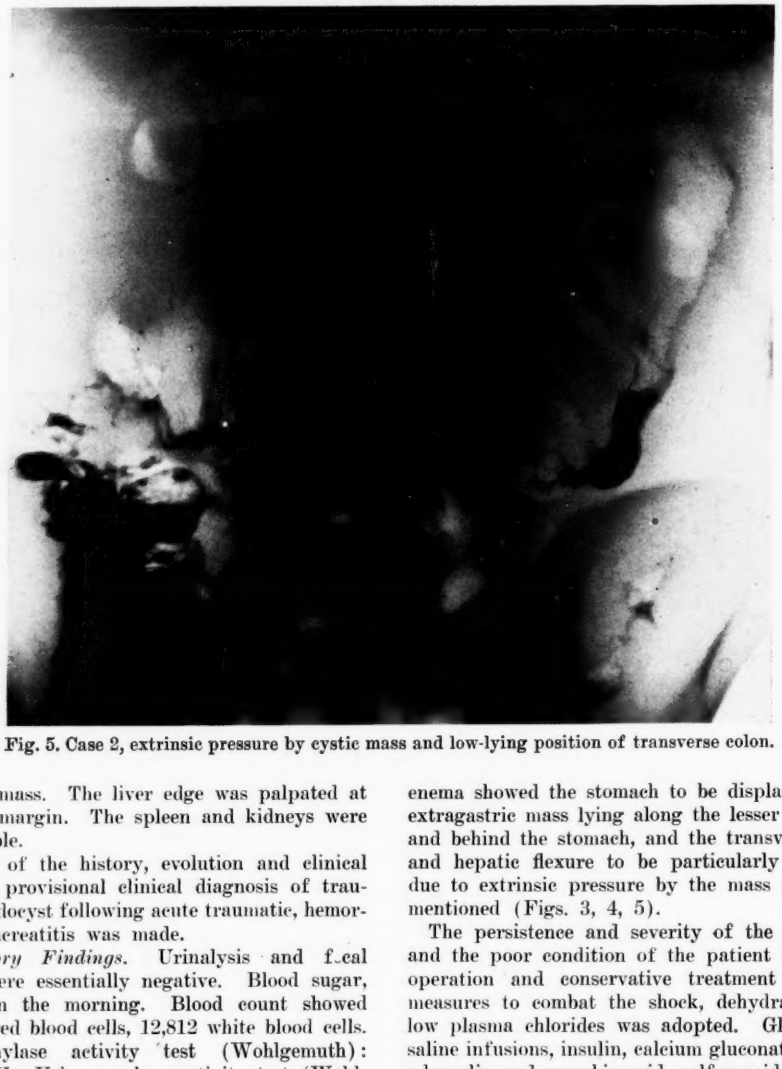

Fig. 5. Case 2, extrinsic pressure by cystic mass and low-lying position of transverse colon.

the cystic mass. The liver edge was palpated at the costal margin. The spleen and kidneys were not palpable.

In view of the history, evolution and clinical findings a provisional clinical diagnosis of traumatic pseudocyst following acute traumatic, hemorrhagic pancreatitis was made.

Laboratory Findings. Urinalysis and fecal analysis were essentially negative. Blood sugar, 1.23 gr. in the morning. Blood count showed 3,200,000 red blood cells, 12,812 white blood cells. Blood amylase activity test (Wohlgemuth): 38/30—64U. Urine amylase activity test (Wohlgemuth): 38/30—128 U.

The increased blood amylase activity found in this case contributed to a diagnosis of pseudocyst enema showed the stomach to be displaced by an extragastric mass lying along the lesser curvature and behind the stomach, and the transverse colon and hepatic flexure to be particularly low-lying due to extrinsic pressure by the mass previously mentioned (Figs. 3, 4, 5).

The persistence and severity of the symptoms and the poor condition of the patient prohibited operation and conservative treatment including measures to combat the shock, dehydration, and low plasma chlorides was adopted. Glucose and saline infusions, insulin, calcium gluconate, cortate, adrenalin and ascorbic acid, sulfonamide and sulfathiazole, and liver extract were administered. Supportive treatment and nursing care were emphasized. The patient improved remarkably under

this regimen and surgery was decided upon for the next morning, the tenth hospital day. But at midnight preceding, the patient took a dramatic change for the worse, vomiting and passing continuously liquid watery stools, both of light brown color. On the morning of the eleventh hospital day examination revealed that the large cystic mass had disappeared completely. There was no palpable mass or distention and tenderness in the upper abdomen. Vomiting stopped in the evening but light brown liquid stools continued to be evacuated until the next day. The temperature fell to normal and pulse was 88 and regular. This unexpected complication suggested that a spontaneous anastomosis between the cystic mass and the digestive tract had occurred (pancreatocystovisceral anastomosis) probably between the cyst and the stomach, the duodenum and transverse colon. The cystic cavity was draining through these anastomoses. In other words, at the onset, this complication was favorable and expectant treatment seemed indicated. The laboratory examination of the vomitus and watery stool revealed a considerable increase in amylase activity and supported the diagnosis of spontaneous rupture of the cyst into the gastrointestinal tract. With improvement of the patient's condition the first day an uneventful recovery was expected, but unfortunately in the succeeding days there was a turn for the worse with fever, singultus, and restlessness. Blood culture was positive for *Escherichia coli* and proper treatment was started. But in spite of all treatment, fever and sepsis persisted, hematemesis and melena developed, the course was downhill and the patient died Jan. 14, 1944.

Postmortem examination revealed severe traumatic laceration and destruction of the body of the pancreas over the vertebral column, generalized necrosis of pancreatic tissue and ruptured splenic vein in the same area. At the lacerated part of the pancreas, filling the lesser omental sac and situated between the stomach, transverse colon, spleen, and liver was a large cystic cavity (pseudocyst of the pancreas) about the size of a child's head, without a wall or epithelial lining, bounded by the peritoneum of the omental sac and of the adjacent organs. There was an acute generalized secondary infection and suppuration of the cystic cavity (peripancreatic abscess). The cystic cavity had ruptured into the transverse colon in two places and into the duodenum, owing to tryptic digestion. Small erosions and ulcerations were disseminated in the mucuous membrane of the stomach; there also were widespread peritoneal and retroperitoneal erosions, marked cloudy swelling and passive congestion of the liver, a few small scattered areas of focal necrosis in the liver. The kidneys showed marked cloudy swelling of the parenchyma.

The pathologic diagnosis was traumatic laceration and destruction of the body of the pancreas, acute traumatic (hemorrhagic) pancreatitis, traumatic pseudocyst of the pancreas, perforation into the transverse colon and into the duodenum, secondary acute suppurative infection of the cystic cavity and formation of peripancreatic abscess due to the communication between the cyst and duodenum and transverse colon.

Case 3. Y. B. H., a white male, aged 35, a farmer, was admitted to the clinic on Oct. 16, 1944, complaining of severe epigastric pain followed by nausea and vomiting and a large abdominal mass in the upper part of the abdomen. The present illness began 45 days prior to admission. The patient had suffered a severe attack of stabbing epigastric pain associated with severe vomiting and nausea. The pain extended to the back and to the left shoulder. It was severe and continuous for the first 24 hours and intermittent for the following days. Nausea was present throughout this period, and the patient vomited occasionally. Twelve hours after the onset of the painful attack, the patient developed a high fever and it lasted several days. Two days thereafter a mass appeared in the left upper quadrant of the abdomen which steadily increased in size during the following days and attained a considerable size prior to admission. He had lost 11 pounds. There was no previous history of gastrointestinal disorders, and bowel function was fairly regular until and during the present illness.

Physical Examination. Examination revealed a well-developed thin, patient acutely ill with profound anemia and pallor. There was marked abdominal distention without rigidity, but with rebound tenderness on pressure over the epigastrium and upper part of the abdomen. In the epigastrium and upper left quadrant there was a large, smooth cystic mass about the size of an adult head which protruded markedly above the abdominal contour and moved slightly with respiration. This cystic mass was extended about 3 to 4 fingers below the umbilicus. Percussion revealed displacement of the stomach to the left in front of the mass, and there was evidence of pressure and inferior position of the transverse colon. The liver, spleen and kidneys were not palpable. There was a definite hypochromic anemia. Increased blood amylase activity favored the diagnosis of pseudocyst of the pancreas, while negative Casoni and Weinberg tests eliminated echinococcus disease.

Roentgenograms after a barium meal and barium enema showed marked anterior displacement of the stomach by an extragastric mass lying behind the stomach, and revealed evidence of pressure on the transverse colon by the same mass (Fig. 6). Clinical and roentgenologic findings and increased blood amylase activity confirmed the diagnosis of pseudocyst of the pancreas due to an acute hemorrhagic pancreatitis.

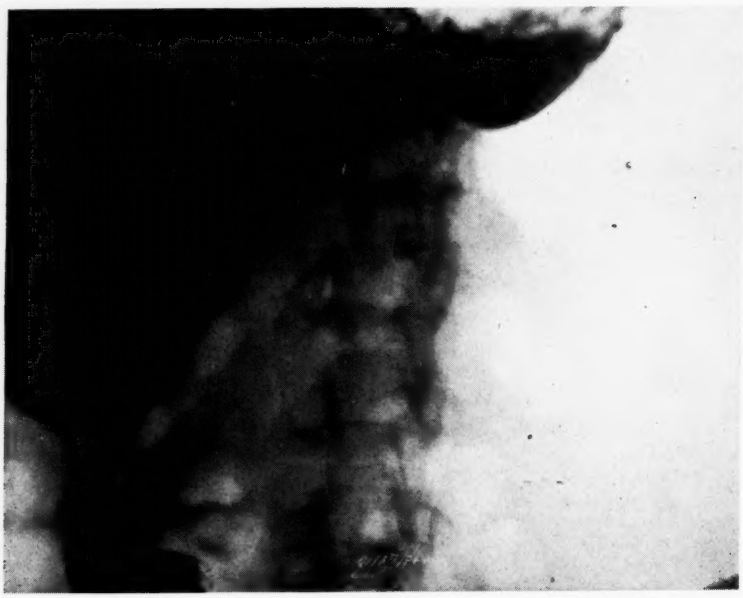

Fig. 6. Case 3, postpancreatitic pseudocyst, gastrocolic species. Remarkable displacement of the stomach.

After the usual preoperative care the patient was brought to surgery on Nov. 21, 1944. The operation was performed by the author. Ether anesthesia was administered and a midline incision was made, extending from the xiphoid process to the level of the umbilicus. The abdomen was opened and a large retroperitoneal cystic mass about the size of a human head was seen and palpated behind the stomach and gastrocolic omentum. The approach was made through the gastrocolic omentum. A large cyst, filling the lesser omental sac and situated between the stomach, transverse colon, and mesocolon was found projecting from the body and caudal part of the pancreas. The cyst was drained of about 2.5 liters of brown, light coffee-colored fluid by suction. Then the cyst was opened and a drain was inserted. The sac was marsupialized and the edges of the cavity were sutured to the peritoneal edges around the drain. The abdomen was closed in layers after a piece of the sac wall was excised for biopsy. The postoperative course was uneventful. The cavity continued to drain small amounts of brownish fluid. Ultimately the drain was removed and the patient was discharged six weeks after admission, with complete relief. Biopsy specimen of the cyst wall revealed fibrotic tissue without epithelial lining. Biochemical report on the fluid removed from the cyst showed it to have a very high amylolytic and tryptolytic activity.

Case 4. M. A. T., 23 years old, white male, unmarried, clerk, was admitted to the clinic on Feb. 7, 1940, complaining of sudden severe epigastric pain followed by nausea and vomiting, and a large abdominal mass in the upper part of the abdomen of 52 days' duration.

The onset of the present illness occurred 52 days prior to admission with a sudden, very severe, gnawing pain in the upper region of the abdomen, especially in the epigastrium, which extended to the back and to the left shoulder, and was accompanied by severe nausea and vomiting. It was so severe as to prostrate the patient completely for about three hours. Subsidence of this painful

attack left him with slight pain and tenderness in the midepigastrium. He was fairly well for the rest of that day, but in the evening, after having eaten heavily and drunk much wine at a banquet, the patient was seized with much more severe pain in the upper abdomen followed by continuous nausea and vomiting. This condition lasted for about three days. The patient was brought to the hospital (Mugla State Hospital) immediately.

Plasmodia were found on clinical and laboratory examination and a diagnosis of malaria was made. Following treatment, he was discharged 10 days after admission. A week later severe epigastric pain associated with nausea and vomiting recurred. A new consultation was held and the patient was readmitted to the same hospital with an impression of acute appendicitis. No operation was performed because of the atypical symptoms which subsided in a few days under conservative treatment. The patient was discharged 10 days after admission.

He was well and symptom-free for 3 to 4 days but then the symptoms recurred. Reexamination revealed an epigastric mass extending to the left hypochondrium. The patient was then transferred to our clinic, 52 days after the onset of the present illness.

Physical examination was essentially negative, except for the abdomen which was soft and asymmetrically distended with no areas of rigidity or tenderness. A large smooth, tense, cystic mass about the size of a child's head was palpable in the epigastrium and the upper left quadrant. It protruded markedly above the abdominal contour and apparently moved with respiration. The cystic mass filled the upper abdomen, especially the epigastrium, left hypochondrium and left flank and extended about 2 fingers below the umbilicus. The cystic mass was surrounded by stomach and transverse colon as judged by palpation and percussion. The liver, spleen, and kidneys were not palpable. It is interesting to note that the size of the cystic mass fluctuated and decreased slightly a few days after admission. Roentgenogram and secretory urogram eliminated hydronephrosis and pyonephrosis but revealed right kidney stones. Laboratory test eliminated echinococcus disease of the pancreas and kidney. Roentgenograms showed the low-lying position of the transverse colon due to extrinsic pressure by the mass previously mentioned. Further fluoroscopic and roentgenographic studies disclosed an extrinsic pressure defect in the stomach between the antrum and the fundus along the great curvature. Lateral roentgenograms revealed that the stomach was markedly displaced to the front by an extragastric mass filling the lesser omental sac and lying behind the stomach. Thus, clinical and radiologic findings and laboratory studies confirmed the diagnosis of pseudocyst of the pancreas due to an acute hemorrhagic pancreatitis.

After the usual preoperative care operation, on Feb. 22, 1940, was performed by Prof. B. Toker and the author. Ether anesthesia was administered and a transverse incision parallel to the costal margin (Körte) was made in the left upper quadrant of the abdomen extending from the costoxiphoid angle to the left hypochondrium. The abdomen was opened and a large tense, cystic mass about the size of a child's head was found behind the stomach and the gastrocolic omentum. The approach was made through the gastrocolic omentum. An enormous cyst filling the lesser omental sac and occupying a position between the stomach and transverse mesocolon extending to the splenic hilus, was found arising largely from the body and the tail of the pancreas. This cyst was strongly adherent to the posterior wall of the stomach and the neighboring organs. The cyst was drained by suction of about 2 liters of brown, coffee-colored, bloody fluid. Then the cyst was opened. There was no epithelial lining. The sac was packed with plain gauze (Mikulicz) and a large rubber drain was inserted. The sac was marsupialized and the gauze was left hanging outside. The abdomen was closed in layers after excision of a piece of the sac wall for biopsy examination.

The postoperative course was uneventful. The cavity continued to drain small amounts of brownish fluid. The gauze, a few days after the operation, and the drain three weeks later were removed. The patient was discharged March 3, 1940, completely relieved, four weeks after admission.

Biopsy of the cyst wall revealed fibrotic tissue without epithelial lining. The biochemical report showed the fluid removed from the cyst to have a very high amylolytic and tryptolytic activity. The amylase activity test, 38°:1111 U.

Case 5. H. K., 27 years old, married white female, was admitted to the clinic on July 25, 1946, complaining of severe pain in the left upper quadrant accompanied by nausea and vomiting and a large abdominal mass in the same region of five years' duration. The first attack, five years prior to admission, lasted one week. Thereafter she had recurrent attacks and remissions. Two months before admission there was repetition of the symptoms and at this time an intraabdominal mass in the same region was noted.

The general physical examination was essentially negative. Local examination disclosed a large smooth, tense tumor mass about the size of a

grapefruit filling the left hypochondrium, outlined just below the left costal margin. It seemed to move with respiration. Liver, spleen and kidneys were not palpable. Laboratory examination and tests showed nothing abnormal. Blood amylase activity (Wohlgemuth test) was 128–4 plus.

A flat x-ray plate of the abdomen revealed evidence of pressure at the distal third of the transverse colon and splenic flexure due to an extrinsic tumor mass, showing homogeneous opacity over the left part of the transverse colon. Fluoroscopic examination and roentgenograms taken after barium meal and barium enema revealed evidence of pressure and low-lying position of transverse colon and splenic flexure due to extrinsic pressure by the mass previously mentioned.

Preoperative clinical impression was cyst of the pancreas due to subacute pancreatitis.

After usual preoperative care operation was performed Aug. 2, 1946, by the author. Under ether anesthesia an incision was made over the midline, extending from the xiphoid process to the level of the umbilicus. A large, smooth, tense retroperitoneal cystic mass was found behind the stomach and gastrocolic omentum. The approach was made through the gastrocolic omentum. A large, retroperitoneal cyst filling the lesser sac was found, projecting largely from the tail of the pancreas. It was intimately adherent to the adjacent organs. The cyst was drained of about 1 liter of white, cloudy, fluid by suction, then opened and examined. There was no epithelial lining. The cystic cavity was packed with plain gauze and a large rubber drain was inserted. The sac was marsupialized and the gauze left hanging outside. The abdomen was closed in layers after a piece of the cyst wall was excised for biopsy examination.

Postoperative course was uneventful. The cavity continued to drain for three weeks. The patient was discharged Sept. 7, 1946, with complete relief.

Biopsy of specimen of the cyst wall showed fibrotic tissue without epithelial lining.

Biochemical report showed the cyst contents to have a very high amylase activity—1024—and tryptic ferment and lipase.

SUMMARY

In the light of our clinical observations and pathologic data, external drainage by marsupialization is the procedure of choice in the surgical treatment of pancreatic pseudocysts. From the facts cited it is hardly justifiable to attribute special merit to total radical extirpation or internal visceral anastomosis. Pancreatocystovisceral anastomosis (internal drainage) may be recommended in the surgical management of true pancreatic cysts, when radical extirpation is not feasible.

Various operative procedures for the surgical treatment of pancreatic pseudocysts are discussed.

SUMARIO

El autor hace una revista detallada de los seudo-quistes del pancreas y a base de sus investigaciones clinico-patologicas concluye que el drenaje externo por marsupializacion es el procedimiento de seleccion en el tratamiento quirurjico de estos quistes. El drenaje interno se recomienda en los verdaderos quistes del pancreas cuando su extirpacion no es posible.

SOMMAIRE

L'auteur présente une revue complète des pseudokystes du pancréas. D'après les recherches cliniques de l'auteur et se basant sur la pathologie de cette condition, Berkay conclut que le drainage externe par marsupialisation est le procédé de choix pour le traitement chirurgical des pseudokystes pancréatiques. Le drainage interne peut être employé pour les vrais kystes du pancréas quand l'extirpation de ces kystes n'est pas possible mais ne doit pas être employé pour les pseudokystes pancréatiques.

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Case Reports

Gallstone Obstruction

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INTESTINAL obstruction caused by gallstone is a relatively rare finding and as a rule it is rarely diagnosed preoperatively. Certainly it ranks very low on the list of causes of intestinal obstruction. This may be due to the fact that it occurs in the older age groups and usually produces rather sudden and complete obstruction with the result that the patient is acutely ill and toxic from whom it is very difficult to get a clear and coherent history. Mayo and his associates,[1] and a review from the Mayo Clinic [2] agree that a history of chronic cholecystitis is of no value in the diagnosis. Gallstone should be suspected in any case of obstruction occurring in an older person where the cause of the obstruction is obscure. Walters and Snell,[3] Jackson,[4] and Moore [5] all agree that it is the cause in from 1 to 2 per cent of all intestinal obstructions. Arnold [6] states that probably the majority of gallstones erode into the duodenum, but they may erode into the large bowel or into the peritoneal cavity or adjacent tissues. In cases where obstruction is produced a flat plate of the abdomen should help with the diagnosis if the stone is radiopaque.

Case 1. Mrs. C. C., a white female of 70, with four living children, was admitted to St. Joseph's Infirmary by ambulance on Oct. 9, 1946. She was complaining of pain in midabdomen, and distention. She had had no bowel movements for the past two days and pain had been increasing for the past two days and had become more localized in the midabdomen on the left side. She had been vomiting for the past 24 hours and had slight fever.

The past history was noncontributory except for the following. She had suffered from indigestion all her life and had periodic attacks of vomiting for the past 30 years. She had never been jaundiced and had never had abdominal pain until the previous July. To her knowledge she had had high blood pressure for the past five years. No particular kind of food seemed to affect her "indigestion" and at times anything she might eat might bring on an attack at any time of the day or night. Last July she had an attack with pain in the right lower quadrant and vomiting. An appendectomy was performed. Since that time she has had other attacks of a similar nature and these attacks have grown progressively worse until present attack three days before admission. There was no history of referred pain to either shoulder, nor of pain in the right upper quadrant.

Physical examination revealed an acutely ill white female with distended abdomen. The abdomen was not rigid but was tender about the umbilicus and slightly higher on the right side. Hyperperistalsis was present. No masses were palpable although the edge of the liver was thought to be palpable by one examiner. Vaginal examination was essentially normal. The heart was slightly enlarged and the pulse rapid and regular. Blood pressure was 180/94. The chest was clear. The remainder of the physical examination was essentially normal for her age.

The patient was given intravenous fluids and Wangensteen suction was instituted. X-ray examination showed dilated small bowel loops. Laboratory work revealed mild anemia, normal white count, and essentially normal chemistry. A diagnosis of intestinal obstruction of the small bowel was made with the cause undetermined. Operation, under gas oxygen-ether anesthesia, was performed through a right rectus incision. An obstruction was found at about midileum with proximal loops dilated and distal gut collapsed. The obstruction was caused by an impacted gallstone which was removed through a small longitudinal incision in the bowel wall which was closed transversely with two layers of interrupted chromic catgut. The gallbladder region was a dense mass of adhesions which was not disturbed. After removal of the stone the small bowel was in good condition with good color and circulation.

Sulfanilamide, 5 Gm., and 300,000 units of penicillin were placed in the abdomen and the wound closed in layers. The patient progressed satisfactory for approximately two weeks at which time she had a severe attack of vomiting and vomited eleven gallstones. These are the small stones seen in Figure 1. The large stone on the left was the

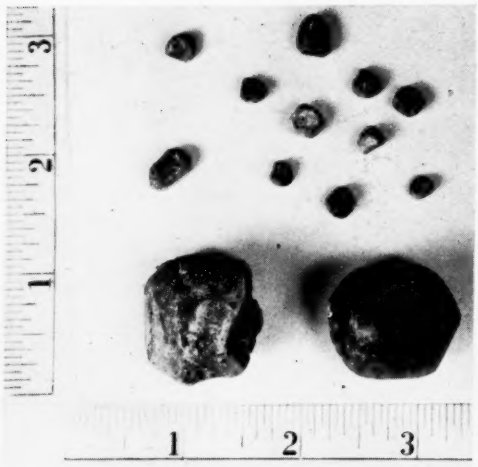

Fig. 1. Calculi vomited by patient.

Fig. 2. Roentgenogram after dilute barium.

one causing the obstruction. Following this attack of vomiting she seemed to do well. Dilute barium was administered through a duodenal tube. The radiologist's report was as follows: "The interior of the gallbladder is filled with barium across the cholecystoduodenal fistula and the cystic duct appears to be filled and is seen as a wormlike shadow just above the small gallbladder cavity. The interior of the gallbladder is probably markedly thickened. There is also irregularity of the distal end of the stomach in the region of the duodenal bulb where there is apparently marked inflammatory granuloma or some other process. I am unable to identify in detail the changes seen at the distal end of the stomach." Following this she seemed to get along very well for three days and then began to have more evidence of obstruction as she became distended again and began having some vomiting and passing very little flatus. These signs, together with some pain in midabdomen, became increasingly severe and another x-ray on Nov. 18, 1946, revealed almost complete obstruction again with dilated small gut loops. A Miller-Abbott tube was passed but did not pass beyond the stomach. She was treated with intravenous fluids and a blood transfusion and taken to surgery where a left rectus incision was made. An obstruction caused by another gallstone about the same size as the first one was found at the terminal ileum approximately 18 inches from the ileocecal junction with hugely distended proximal bowel and collapsed distal gut. The bowel wall was not compromised and the stone was removed in a manner similar to the first and the bowel closed. Abdomen was closed in layers and patient returned to her room in good condition. Following this operation the patient made an uneventful recovery except for gross blood in her stools on four days after operation which was believed to come from either the suture line in the bowel or from an eroded vessel in the duodenum. The patient is well and has no complaints at the present time, approximately three months after her final operation. Figure 2 shows the x-ray after the dilute barium was given. Figure 3 shows the x-ray revealing obstruction before final operation.

Case 2. Mrs. J. R., a 58-year-old white female, was seen at the office and gave a typical history of cholecystitis and cholelithiasis. She had had repeated attacks of pain and tenderness in the right upper quadrant for the past 10 years. She had been jaundiced during two attacks. She had indigestion made worse by fatty or fried foods and had had pain in her right shoulder during several of the attacks. Physical examination was negative except for a mass in the region of her gallbladder which was tender to palpation. She was sent into the hospital as an outpatient for gallbladder study. The radiologist reported a stationary calcified area as large as a hen's egg in the region of the gallbladder on all plates. The gallbladder was not visualized by dye. He interpreted this shadow as a large gallstone. The patient was advised to have her gallbladder removed but she refused operation and returned to her home. Two months later she returned to our office with the news that she had passed the gallstone per rectum. She gave us the gallstone which was a typical stone about the size of a

large hen's egg, rough and irregular in shape. She was sent into the hospital for another x-ray and the radiologist reported, "the gallstone reported previously is now missing." She has had no recurrences of her pain or jaundice for six months following passing of the stone.

SUMMARY

Two cases are presented in which gallstones were passed orally and per rectum, and which caused obstruction of the small intestine. Gallstone obstruction is somewhat rare and is difficult to diagnose before operation. Relatively small gallstones may produce obstruction if they erode into the small intestine, while very large stones may be passed if they erode into the large bowel. On the basis of two obstructions in the same patient we do not agree with Kalvelage who states that the small intestine with impacted gallstone should be exteriorized, the stone removed and the small bowel closed at a later date. If there is no gangrenous bowel or if the blood supply of the bowel has not been damaged we feel that it should be closed at the time of operation and that an ileostomy should be avoided if at all possible.

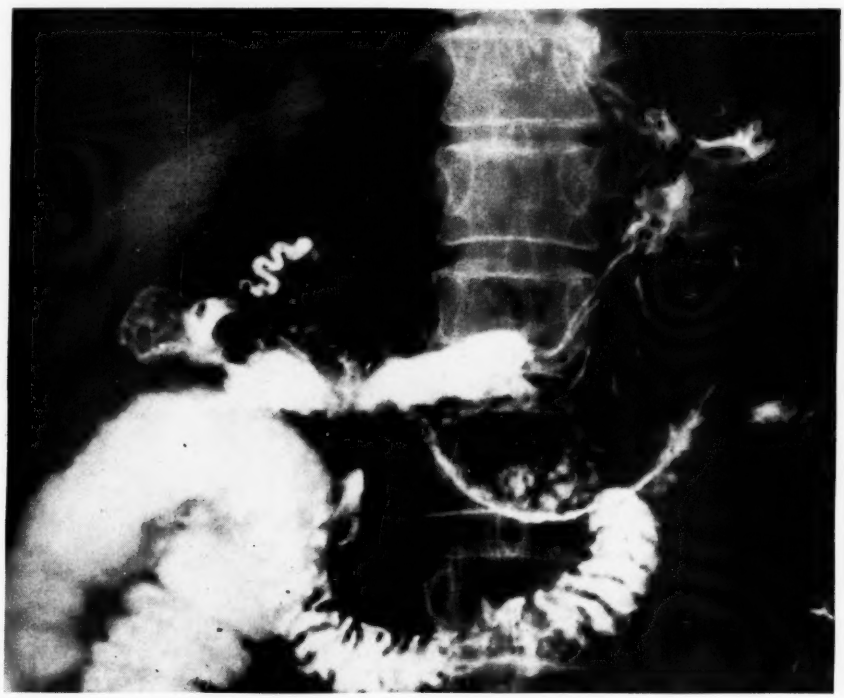

Fig. 3. Obstruction before operation.

COMMENT

Case 1 has several unusual features: 1. We have been unable to find a report of gallstone obstruction twice in the same patient. 2. She vomited 11 gallstones between obstructions. 3. The obstructions were in midileum and terminal ileum and not at the ileocecal junction where most obstructions of this sort are reported to occur. 4. This patient never had upper right quadrant pain. 5. No stones were seen on x-ray examination.

Case 2. Undoubtedly this patient developed a fistula between the gallbladder and the colon and the huge gallstone eroded through and was passed per rectum.

SUMARIO

Se han presentado dos caso de calculo biliar que habian producido la obstruccion del intestino delgado y que fueron expulsados uno por la boca y el otro por elrecto.

A base de dos obstrucciones que ocurrieron en el mismo paciente no estamos de acuerdo con las declaraciones de Kalvelage que aconseja la exteriorizacion del segmento obstruido despues de haberse removido el calculo. Si no hay evidencia de gangrena intestinal o de dano a la circulacion del segmento obstruido es nuestra opinion que el debe de cerrarse inmediatamente despues de la extraccion del calculo obstruyente. La ileostomia debe de evitarse lo mas posible.

RÉSUMÉ

L'auteur presente deux cas de cholelithiase dans lesquels des calculs furent rejetés par la bouche et par le rectum et qui furent associes avec une obstruction de l'intestin grêle. Se basant sur deux obstructions chez le même malade, l'auteur prétend que dans les cas de calculs enclavés dans l'intestin grêle, on ne doit pas extérioriser l'intestin. On ouvrira l'intestin et on retirera les calculs biliaires. On réparera l'intestin grêle dans la même séance. Si l'intestin n'est pas gangréneux, si la circulation sanguine n'a pas été endommagée, l'auteur recommande que l'on ferme l'intestin avant de terminer l'operation. Si c'est possible on ne doit pas avoir recours a l'iléstomie.

RIASSUNTO

Descrive due casi di ostruzione intestinale da calcoli biliari. L'A. non e d'accordo con Kalvelage, il quale afferma che l'intestino tenue con calcoli biliari incuneati dovrebbe essere esteriorizzato, il calcolo rimosso e l'intestino rinchiuso in un secondo tempo. Se la gangrena non si e' ancora stabilita e se l'afflusso di sangue nell'ansa intestinale non o' compromesso, l'intestino dovrebbe essere richiuso al momento dell'operazione, evitando un'ileostomia.

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Sección en Español

Evaluación de la Gastroscopía en el Estudio del Cancer Gástrico

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SUMMARY

IN the present study the importance of gastroscopy in the diagnosis of gastric cancer is discussed. Its value depends upon the localization, extension and type of tumor. Gastroscopy is considered of no value in the diagnosis of the diffuse infiltrating retracting type cancer or linitis plastica. Infiltrating carcinomas localized in the middle and lower third of the stomach seldom present any difficulty to gastroscopic diagnosis, but x-rays afford a better diagnosis of the tumors located in the cardia and pylorus. In the differential diagnosis of the ulcerative lesions the analysis of the entire lesion is considered of more importance than the study of particular differential "signs." Gastroscopy is very valuable in the differential diagnosis of the different conditions which may simulate filling defects by x-ray, such as polypoid cancer, the tumoral and nodular forms of "hypertrophic gastritis," the benign polyps and the redundant gastric mucosa.

The diagnostic importance of gastroscopy is great, complementing the x-ray findings in the study of gastric cancer, but it cannot determine the operability of patients with gastric cancer.

La enorme frecuencia del cancer gástrico crea un problema de gran importancia en lo que se refiere a su diagnóstico precoz, permitiendo así la oportuna resección quirúrgica.

Desde el descubrimiento en 1932 del gastroscopio semiflexible por Wolf y Schindler, se han hecho muchos estudios sobre la valoración de la gastroscopía en el diagnóstico del cancer gástrico, muchos de ellos de índole estadística.[1-14] Schindler [14] ha encontrado que usando conjuntamente la radiología y la gastroscopía como medios diagnosticos en las enfermedades del estómago existía un margen de error de solo 3 por ciento y un diagnóstico incierto en un 4 por ciento. Últimamente Ricketts y Pollard [13] en una serie de 1297 casos con 1500 gastroscopias y hallaron asimismo una marcada correlación entre los hallazgos radiológicos y gastroscópicos.

A continuación se discute el valor de la gastroscopía en el hallazgo precoz de las lesiones malignas, del tipo de tumor, de su localización y extensión y el valor de este procedimiento en el pronóstico operatorio de dichas lesiones.

El hallazgo precoz del cancer gástrico es un ideal no alcanzado hasta el momento presente. Se ha intentado el diagnóstico de lesiones precancerosas [15] pero con poca fortuna pues se ha visto que este no es posible con los medios de diagnóstico con que actualmente cuenta la ciencia médica. La palabra diagnóstico "precoz" puede ser interpretada en dos diferentes maneras [16]: la primera como diagnóstico precoz permitiendo "la curación" despues de la resección operatoria. Al presente ni la radiología ni la gastroscopía son procedimientos que puedan llenar este requisito. Cuando aparecen los primeros síntomas clínicos que llevan al enfermo hacia una consulta médica en el mayor número de casos la neoplasia primaria ya ha producido metástasis locales, regionales o distales, dando por resultado una alta recurrencia del mal. El segundo significado de la parabra "precoz" se refiere al diagnóstico de tumores de tamaño pequeño. Usando este segundo significado la contribución de la gastroscopía es de sumo valor como ha sido probado por diferentes autores.[17-19]

En el diagnóstico de las lesiones llamadas

"precancerosas" tales como la atrófia de la mucosa gástrica la úlcera gástrica benigna y la poliposis del estómago existe hoy una marcada duda en considerar las dos primeras como tales. De acuerdo a muchos autores la atrófia de la mucosa gástrica predispone al cancer. Hurst [20] manifiesta que la gastritis crónica es la enfermedad primaria común del estómago y cree que su prevención seria la prevención de la úlcera y el cancer gástricos. Modernos estudios histológicos y patólogicos no han demostrado que la gastritis crónica o la úlcera benigna sean lesiones precancerosas.[21, 22] Moutier [23] opina que la gastritis atrófica no es una enfermedad lel estómago pero la expresión de una condición general del organismo. Estudios clínicos y patológicos no han podido demostrar que la llamada "gastritis atrófica crónica" sea producida por una inflamación de la mucosa gástrica. Benedict [24] ha sugerido es debida a factores de deficiencia. Guiss y Stewart [21] han encontrado una ocurrencia similar de gastritis atrófica en casos con diferentes enfermedades gástricas no malignas y en casos de cancer gástrico. Los mismos han hallado en autopsias de sujetos aparentemente normales por encima de los 40 años que el 82 por ciento de estómagos presentaban gastritis atrófica, y que esta existía en el 97 por ciento de estómagos con cancer gástrico. La transformación de la úlcera benigna en maligna no ha sido probada hasta la fecha. Ewing propiamente [16] dice, "El tema de la histologia del cancer gástrico esta en su infancia, si ha alcanzado ya este nivel."

El análisis del tipo de cancer gástrico ha sido planteado siguiendo dos clasificaciones la una microscópica [25] y la otra macroscópica.[26]. Schindler [16] ha encontrado la segunda de mas valor. El mismo autor [16] ha comparado la importancia del estudio macroscópico y microscópico del cancer gástrico en 39 enfermos encontrando que no existe entre ambas una estricta correlación.

El tipo macroscópico de cancer y su extensión gástrica en el examen gastroscópico han sido sugeridos como criterios de la operabilidad de los enfermos.[15, 16] Esto no es aceptable pues la moderna cirujia ha hecho posible la resección tumores abdominales de tamaño considerable incluso con metástasis. La frecuencia de la resección del cancer gástrico hoy ha alcanzado el 43.5 [27] y 44 por ciento.[28] Frecuentemente es posible apreciar que ciertos tumores de pequeño tamaño producen apenas iniciadas extensas metástasis (tumores de Jarko) y por el contrario ciertos tumores polipoides de gran tamaño no las producen sino muy tardíamente. El criterio de resección gástrica es pues un problema en gran parte dependiente de si existen o no metástasis del tumor gástrico y del tipo de metástasis.

Las lesiones malignas del estómago pueden ser de tipo infiltrante, polipoide o ulceroso. En el examen gastrocópico se debe ser considerar en forma particular la localización, el tamaño, la extensión y el tipo de la lesión.

El tipo infiltrante que es el de peor pronóstico ha sido encontrado por Schindler [29] en el 63.2 por ciento de los casos. La infiltración carcinomatosa puede ser difusa o localizada. En la primera llamada linitis plastica la gastroscopía poco contrubuye al diagnóstico, rara vez el gastroscopio puede ser introducido en el estómago, pues el cardia se encuentra infiltrado por el tumor. En estos casos el diagnóstico queda pues reservado para la radiología. El cancer infiltrante de tipo localizado aparece gastroscópicamente mostrando una mucosa indurada, rígida, granular, pálida y fija. El diagnóstico diferencial de estos casos incluye: la sifilis, el limfoblastoma y limfosarcoma y la hyperplasia de la mucosa (gastritis hipertrófica). Cuando el cancer infiltra el antro pilórico le confiere la apariencia de un cono rigido bastante característico. En otras ocasiones la infiltración cancerosa que sigue los linfáticos del estómago toma un aspecto concéntrico invadiendo un segmento sumamente localizado, lo cual es claramente visto en los tumores localizados a nivel pilórico. Estas lesiones de tipo concéntrico producen una obstrucción pilórica que en veces no son correctanente diagnósticiadas por rayos X o por la gastroscopía. Por la última se puede apreciar una imagen muy similar al piloro normal, con ondas peristálticas que terminan a nivel de la obstrucción en forma concéntrica y diafragmática. Se trata de una imagen pseudo pilórica.

Es mas indicado el emplear el término cancer ulcerado que el de úlcera maligna, pues posiblemente todas las lesiones malignas ulceradas han sido desde su inicio cancerosas. El diagnóstico diferencial entre cancer ulcerado y la úlcera benigna del estómago depende de muchos factores, uno de los más importantes es la localización de la lesión ulcerosa. Schindler [30] ha hecho un estudio detallado de los signos en favor de las úlceras benignas y malignas dividiéndolos en cuatro grupos. Estos signos si bien ayudan considerablemente en el diagnóstico gastroscópico del cancer ulcerado ninguno de ellos es sin embargo patognomónico. Al hacer el diagnóstico diferencial de las lesiones muy a menudo se encuentra que los datos de más interes estan no propiamente a nivel de la ulceración sino en la mucosa inmediata a esta. La apariencia de la lesión ulcerosa en conjunto es de mas importancia que el estudio en particular de estos signos. La gastroscopía realizada por un experto endoscopista es de gran valor en el diagnóstico de las ulceraciones gástricas. Schindler ha encontrado que las úlceras con infiltración gástrica de etiología maligna ocurren en el 17.6 por ciento y aquellas sin infiltración gástrica en el 1* por ciento de los casos.[29]

Las masas polipoides y pseudopolipoides del estómago producen al exámen radiológico una falta de relleno de la imagen de bazio caracteristica. Estas imagenes al exámen gastroscópico pueden ser diagnosticadas corro debidas a diferentes lesiones v.gr.: las formas de apariencia nódular y tumoral de las "gastritis hipertroficas," la poliposis multiple benigna del estómago, los tumores benignos del estómago y la mucosa redundante gástrica. El tipo de carcinoma polipoide ha sido encontrado por Schindler con una frecuencia de 2.9 por ciento.

Cuando las lesiones polipoides estas localizadas cerca del cardia el gastroscopio, a menudo no puede ser pasado al estómago. Moutier [31] ha individualizado la región yuxtacardiaca en clínica, radiología y gastroscopía, criterio que tiene mucho interés en el diagnóstico diferrencial de las lesiones situadas en el cardia o en las inmediaciones de esta región. Cuando los tumores polipoides estan localizados en el tercio inferior o medio del estómago frecuentemente presentan poco dificultad en el diagnóstico gastroscópico.

La gastritis crónica hipertrófica ocasionalmente se acompaña de un desarrollo considerable de los pliegues de la mucosa gástrica, los cuales producen imágenes radiológicas con falta de relleno que son dificilmente diférenciables de las producidas por un cancer polipoide. En mi experiencia he encontrado de gran valor al hacer el diagnóstico diferencial gastroscópico de esta variedad de gastritis hipertrófica el hallazgo en la una mucosa, con una granulación que semeja las pequeñas piedras de un pavimento y que es característica de las gastritis hipertrófica, en estos casos los pliegues gástricos siguen una dirección paralela al eje mayor del estómago. En la literatura se han descrito muchos casos de gastritis hipertrófica los cuales simularon un cancer gástrico el que fué desvirtuado luego histologicamente.[31-38] La gastritis hipertrófica de tipo nódular tiene un aspecto muy particular produciendo nódulos que simular imágenes laculares múltiples del estómago. La mucosa al examen gastroscópico aparece cubierta de eminencias semejando pólipos los cuales pueden alcanzar en ciertos casos el tamaño de una cereza.[39] Los tumores benignos gástrico producen imágenes de dificil interpretación radiológica cuando son confluentes simulando el cancer gástrico. La gastroscopía no solo permite hacer este diagnóstico con gran aproximación sino en algunos casos aun establecer la transformación de un tumor benigno en maligno como fué observado por nosotros en un caso.[13] Schindler [40] ha descrito un signo que el considera de gran valor en el diagnóstico de los tumores benignos gástricos. Este consiste en la presencia de un pliegue de la mucosa en la superficie del tumor reduciendo el espacio que media entre el tumor benigno y la mucosa que lo cubre.

La tercera condición que simula radiológicamente una imagen polipoide debida a cancer, es el prolapso de una mucosa gástrica normal punto el cual no ha recibido énfasis alguno hasta la fecha. En él, los pliegues son de tamaño considerable, especialmente a nivel del antro produciendo radiológicamente una

imagen de "papel arrugado." Estos pliegues aparecen y desaparecen con las contracciones del estómago y se borran con la insuflación gástrica. Ultimamente tuvimos la oportunidad de ver tres de estos casos diagnósticados radiológicamente como cancer los cuales en sucesivos exámenes gastroscópicos y radiológicos se mostró definitivamente eran debidos a la presencia de una mucosa gástrica redundante. En estos casos los pliegues formados estaban cubiertos de una mucosa normal, a diferencia de los gruesos pliegues indurados con mucosa de aspecto parimentoso que se hallan en la gastritis crónica hipertrófica.[41] Moersch [42] ha descrito un caso de mucosa redundante del estómago en la cual la lesión fué interpretada gastroscópicamente como cancer y solo en la operación pudo ser establecido el correcto diagnóstica. Cordier y Chevalier [43] han descrito un caso con signos radiológicos sugiriendo un tumor gástrico el cual fué encontrado con la ayuda de la gastroscópia como debidos a un edema del antro pilórico del estómago produciendo un aspecto pseudo tumoral, que los autores sugieren como producido por un edema angioneurótico.

En 1297 casos consecutivamente estudiados por la radiología y gastróscopía, algunos fueron diagnósticados solamente por rayos y otros solamente por la gastroscopía.[13] En el primer grupo hubieron 21 casos. La localización de la lesion fué:

Cardia	1
Tercio medio del estómago	4
Píloro	3
Tercio inferior del estómago	11
Lesión no especificada	2
Total	21

El diagnóstico gastroscópico en estos casos fué:

Gastritis atrófica	6
Gastritis hipertrófica	5
Gastritis mixta: atrófica e hipertrófica	2
Negativo	5
Examen no satisfactorio	3
Total	21

En 7 de estos casos no pudo seguirse la evolución de los enfermos no comprobándose la veracidad de dicho diagnóstico, en tres de ellos el diagnóstico radiológico mostró ser equivocado en la intervención quirúrgica y en 11 pudo ser comprobado. En todos estos casos la lesión cancerosa no fué visualizada o fué incorrectamente interpretada por el gastroscopista.

El cancer gástrico fué diagnósticado en 10 casos por gastroscopía y no por radiología. En uno de estos enférmos el examen histólogico del estómago demostró un proceso benigno, dos no tuvieron comprobación operatoria y en 5 fué comprobada la veracidad del diagnóstico gastroscópico. En estos 5 casos el tumor fué ulcerado en tres, polipoide en uno y mixto en el quinto.

RESUMEN

La importancia de la gastroscopía en el diagnóstico del cancer gástrico debe ser considerada teniendo en cuenta la locilzación de la lesión, su extensión y tipo. En la forma difusa infiltrante neoplástica o linitis plástica el valor gastroscópico es mínimo siendo la radiología el método de elección. Los carcinomas infiltrantes localizados del estómago son en general diagnósticables fácilmente por gastroscopía. La radiología permite una información en mas precisa sobre las tumores localizados en el piloro o en el cardia. El estudio de la apariencia en conjunto de una lesión ulcerosa es considerado de mas valor en la diagnóstico diferencial de las lesiones ulcerosas que el estudio de signos en particular. La gastroscopía tiene gran valor en el diagnóstico de las diversas lesiones que producen una imagen radiológica con falta de relleno de baritado tales como el cancer polipoide, los tipos nodular y tumoral de las gastritis hipertrófica, los tumores benignos y la mucosa redundante gástrica.

La importancia de la gastroscopía como coadyuvante en el diagnóstico radiológico del cancer gástrico es muy valiosa. Se considera que no es posible por la gastroscopía el determinar la operatidad del cancer gástrico.

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Editorial

Reactions to Intravenous Infusions

THE recent recall by a dependable pharmaceutical house of a batch of dextrose distributed for intravenous administration again focuses attention on the problem of reactions to intravenous infusions. Aside from such unfortunate incidents as contaminated commercially produced material, the fact should not be overlooked that instances of reactions may occur sporadically in hospitals, such incidents apparently being unrelated to the commercial product used. This problem has not received the attention it deserves from those responsible for the setting-up of hospital laboratory technics for the proper care of laboratory wares and equipment. Such equipment frequently is left to the care of relatively untrained laboratory assistants or undergraduate nursing personnel who through no fault of theirs lack the background knowledge necessary properly to evaluate the problems involved.

The concept of a pyrogenic substance produced by bacteria was established by Seibert [1] who showed by animal experimentation that the compounds she named "pyrogens" were the product of bacilli belonging to Jordan's Group XI, usually present in river water. Rademaker [2] found them in varying numbers in tap water in numerous cities, their number varying with the seasons. Following the work of Seibert other investigators demonstrated that a number of organisms, pathogenic and nonpathogenic, were capable of producing pyrogens, though all that is known is that pyrogen is a proteinlike substance containing nitrogen and is of alkaline reaction. The commercial production of pyrogen-free intravenous solutions was the result of applying the principles evolved by Seibert in 1924 and which were added to by Rademaker in 1930. In spite of this, reactions continue to occur, and almost two decades after the first principles for the prevention of such reactions were set forth, they have been repeated and enlarged upon.[3]

That the commercial solutions cannot be blamed in all instances of reaction following intravenous infusion has been shown beyond a doubt. According to Rademaker, the blame falls more often than suspected on those responsible for the care of glassware and equipment in individual hospitals. Since tap water has been shown to be a source of contamination it would seem clear that it is folly to wash and rinse glassware and tubing in tap water and store it without sterilization since Rademaker found that pyrogen can be developed within two hours at room temperature in the drying films of moisture remaining in such tubing and equipment. "Indeed, a sufficient amount of pyrogen can be formed within an intravenous needle rinsed in tap water to produce a reaction." Furthermore, the extreme solubility of pyrogen accounts for the ease of reaction when pyrogen-free solutions are run through contaminated needles, tubing, etc. Rademaker suggests as an added safeguard that 50 to 100 cc. of pyrogen-free solution be run through the intravenous set and wasted, before inserting the needle into the vein. In other words, it is not the tubing itself that is at fault, but the film of water remaining after rinsing. If disposable tubing is not available it is recommended that "careful cleansing of tubing be followed by rinsing two or three times with pyrogen-free distilled water and *immediate* sterilization." Needles, also, should be cleansed and sterilized at once. To allow needles to stand for some time before sterilization, whether by boiling or autoclaving, favors pyrogen formation. The same principles apply to the care of glass-

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ware and other equipment. In the case of solutions prepared in hospitals, "proper preparation into pyrogen-free glassware with immediate sterilization still are the criteria in the production of pyrogen-free solutions." Following preparation of these solutions the distilling apparatus should be cleansed immediately, and cleansed again at regular intervals. Since in hospitals the biologic assay method of testing solutions is not employed, the first indication of contaminated solutions is the occurrence of a number of reactions.

It seems apparent, then, that in hospitals the principal source of reactions may be improperly cleansed and sterilized intravenous equipment. Obviously, responsibility lies with those entrusted with the training and supervision of personnel caring for such equipment to see that this personnel has the proper understanding of the factors involved in the production of reactions to intravenous infusions.

L. G.

News Notes

Sixth International Assembly, International College of Surgeons, Rome, May 16 to 23, 1948

The scientific sessions, as well as the exhibits, were held in the Policlinico of the University of Rome. Representatives from almost every part of the world attended. The scientific program and the social functions were an unqualified success.

A special Committee on the History of Surgery was presided over by **Prof. A. Pazzini**, Director of the Institute of History and Medicine at the University of Rome, and a Committee presided over Exhibits of Modern Surgery.

A Ladies' Reception Committee arranged for the complete and delightful entertainment of wives and guests of visitors.

During the Assembly one thousand members of the International College of Surgeons and their families were received in the **Vatican** by **H.H. Pope Pius XII** who delivered a special message to the Assembly.

Honorary fellowships in the International College of Surgeons were conferred upon Prof. Rafaele Paolucci and Prof. A. Mario Dogliotti.

Following the Assembly in Rome, those in convention proceeded to **Turin** for three "**Surgical Days**" to honor the memory of the great Italian surgeons, Profs. Donati, Carle and Uffreduzzi, under the presidency of Prof. A. Mario Dogliotti. The scientific papers, clinics, and receptions at Turin were exceptionally brilliant and were a fitting complement to the Assembly in Rome.

The following were in charge of the Assembly:

Honorary President, Dr. Rafaele Bastianelli, Rome

Presidents, Dr. Rafaele Paolucci, Rome; Dr. A. Mario Dogliotti, Torino

Vice-Presidents, Dr. C. Marino Zuco, Rome; Dr. E. Mingazzini, Rome; Dr. G. Pieri, Udine; Dr. P. Valdoni, Rome

General Secretary, Dr. Giuseppe Bendandi, Rome

Proceedings, House of Delegates, International College of Surgeons

First Session

Transactions and Minutes of the House of Delegates

1. Call to Order:

In the absence of Dr. A. A. Berg, who was prevented from presiding by a previous important appointment, the meeting was called to order by Dr. Francisco Graña.

2. Roll Call:

In addition to a quorum of voting officers, trustees and delegates, a large representation of delegates and members from many countries also was present.

Among the communications received was a letter from the Surgeon-General of the United States Navy which read as follows:

"To the Members of the International College of Surgeons with International Assembly, Rome, Italy:

"The Bureau of Medicine and Surgery is honored by your invitation to participate in the Sixth International Assembly of the International College of Surgeons and presents its exhibit, 'Highlights of Military Surgery in World War II.'

"In essence, the outstanding accomplishments of Medical Science during this period are directed to advances in our transportation of casualties and the widespread use of whole blood and antibiotics.

"Their use not only immensely broadened all fields of surgery but resulted in significantly low mortality rates never before achieved.

"The medical and surgical accomplishments of World War II are now dedicated to peace.

"Physicians of every land and creed once again join in alleviating human suffering everywhere.

"The Bureau of Medicine and Surgery salutes the International College of Surgeons in its worldwide endeavor to extend the advances of medical science to all mankind."

(Signed) C. A. Swanson
Rear Admiral M.C.
Surgeon-General U. S. Navy

3. Approval of Minutes:

The Minutes of the Meeting of the House of Delegates of March 27 and 28, 1946 (Lima, Peru), and of all interim meetings and transactions of the Executive Council and International Board of Trustees from March 27, 1946, to date, were fully approved, ratified and confirmed by vote of the House of Delegates.

4. Appointment of Committee on Nominations:

Dr. Graña appointed the following Committee on Nominations for consideration of candidates for International offices:

Dr. Harry E. Bacon	United States
Dr. Aurelio Diaz Ufano	Peru
Dr. Francisco Fonseca Garcia	Mexico
Dr. Endre Hedri	Hungary
Dr. Felix Mandl	Austria

5. Reports of Officers:

Reports of the Treasurer and Secretary were read and approved.

6. Reports of Committees:

Reports of the Chairmen of the Committee on Foreign Affairs; Publications Committee; Assembly Committee; and of the Editor of the Journal were read and approved.

Upon motion duly made and seconded, the House of Delegates voted that, if possible, beginning with January, 1949, the Journal would be published monthly instead of bimonthly.

7. Introduction of Resolutions:

The following Resolutions and Amendments to the **Constitution and By-laws of the International College of Surgeons** were presented, to be voted upon at the Closing Session of the House of Delegates:

RESOLUTION 1

It was moved that Section 6 of Article III of the By-laws of the International Constitution (page 16) be amended to read:

Section 6. It shall hold a minimum of four meetings a year and at such other times as may be necessary, subject to the call of the President or on petition of four members of the Board, and such petition to the President by four members of the Board shall make it mandatory that a meeting be called.

RESOLUTION 2

Whereas, it is not the intention of the International College of Surgeons to conflict with the existing laws of any country, state or dominion in which it shall have Chapters,

Be It Resolved that the Constitution and By-laws of the International College of Surgeons be amended by the insertion of the following paragraph to be known as Section 7 of Article II on page 9 of the Constitution of the International College of Surgeons:

"Should it become essential, by reason of existing laws of any state, country or dominion, that local incorporation of a chapter is necessary in order to comply with the laws of that particular state, country or dominion, such incorporation shall in no way affect or change or modify the sense of Section 6 of the Constitution of the International College of Surgeons."

RESOLUTION 3

Whereas Article I, Section 6 of the By-laws of the International Constitution gives power to members of the House of Delegates and the International Board of Trustees and the Executive Council to vote by proxy, and

Whereas such proxies are often taken advantage of,

Be It Resolved that the President of the College appoint a committee of three to look into the matter, and to suggest to the Board of Trustees changes in regard to proxies if such changes are needed or desirable in the interests of the College.

RESOLUTION 4

Whereas, according to the Constitution and By-laws of the International College of Surgeons, the members of the International Board of Trustees are elected biennially, each for a two-year term, thus creating vacancies in all offices simultaneously, and

Whereas, such procedure is undesirable in that all Trustees are new in office and unacquainted with business, procedures, etc., and

Whereas, in similar organizations a so-called staggered term of office has been adopted to alleviate this difficulty,

Be It Resolved that the members of the International Board of Trustees of the International College of Surgeons be elected to serve in the following manner: one-third to serve for two years; one-third to serve for four years; and one-third to serve for six years.

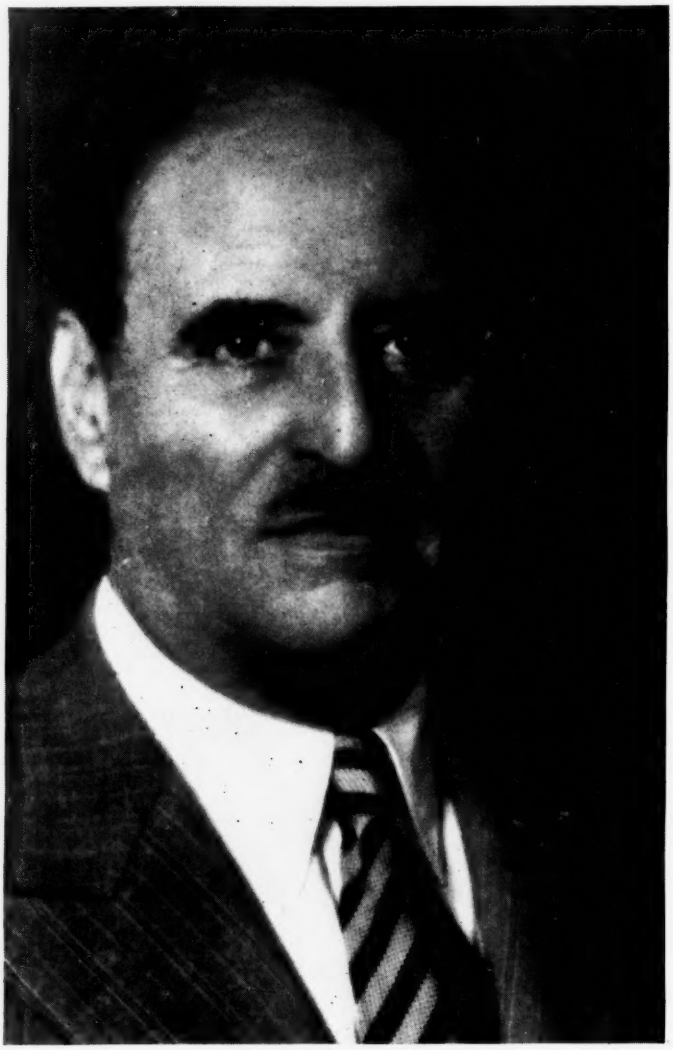
Be It Further Resolved that said procedure be adopted by amendment to the Constitution and By-laws of the International College of Surgeons.

RESOLUTION 5

Resolutions were introduced to amend the Con-

stitution and By-laws of the International College of Surgeons, printed in 1947, as follows:

Article III, page 9, should be changed to read:



Francisco Graña, M.D., F.I.C.S., F.A.C.S.
President of the International College of Surgeons

"Of the fees and dues collected by any component chapter 60 per cent shall remain the property of the chapter, and the balance of 40 per cent shall be the property of and be remitted to the Treasury of the College."

In Article X, Section 1, page 13, should be inserted after the word "Constitution": ". . . with the exception of the Preamble and Articles I and II, and Sections 1, 2, 3, 4, 5 and 6 of the latter."

Article X, Section 2, page 13, should read, after the word "amended": ". . . with the exception of the Preamble and Articles I and II and

Sections 1, 2, 3, 4, 5 and 6 of the latter."

In Article II, Section 2 of the By-laws, page 15, the following changes should be made:

Herbert Acuff, M.D., F.I.C.S., F.A.C.S.
President-Elect of the International College of Surgeons

Line 9, after the words "for any reason," insert "or in his absence,";

Line 12, after the words "such duties," insert "or if for any reason that is not possible,";

Line 13, delete "Board of Trustees" and substitute "First Vice-President."

In Article II, Section 4 of the By-laws, column 2 on page 15, the following changes should be made:

Line 7, after the words "Executive Council" insert the word "he";

Line 11, delete "he may" and substitute "the Executive Council shall";

Line 13, after the word "purpose" insert the words "the Treasurer";

Line 17, delete the words "usually pertain to his office" and substitute "as are assigned to him by the Board of Trustees."

Article VIII, Section 3 of the By-laws, page 17, should remain as it is up to and through "$25.00" (fifth line) and the rest of that Section should be deleted. At the end, add: "The subscription price of the Journal shall be determined by the Executive Council."

RESOLUTION 6

Whereas, the growth of the College and its Chapters is self-evident, and

Whereas, representation on the International Board of Trustees by these new Chapters seems desirable,

Be It Resolved that the number of members of the International Board of Trustees be increased from forty-one to forty-seven, and that Article VII, Section 2 of the Constitution and By-laws, relating to membership of the Board of Trustees, be changed accordingly.

RESOLUTION 7

Whereas, a number of persons have been greatly instrumental in bringing this Sixth International Assembly of the International College of Surgeons to a high degree of success and perfection, be it resolved that letters of thanks be sent to all whose efforts contributed to the occasion.

8. Submission of Invitations for the Next International Assembly.

Invitations were received to hold the Seventh International Assembly in various parts of the world, the most consideration being given to one from the Mayor of the City of Vienna, and one from the Argentine Government. After discussion, and because the invitation from the Argentine Government was received prior to that from the Mayor of Vienna, it was decided that the Seventh International Assembly would be held in Buenos Aires, Argentina, in 1950, cordial thanks being extended to countries from which invitations had been received.

9. Miscellaneous Business.

The Secretary presented the petition of the Philippine group for a Charter, and asked the approval of the House of Delegates. Said petition was unanimously approved.

The Opening Session of the House of Delegates adjourned at 1:45 P.M.

Closing Session

The Closing Session of the House of Delegates of the Sixth International Assembly of the International College of Surgeons was called to order by Dr. A. A. Berg in the Policlinico of the University of Rome, on May 17, 1948, at 10 A.M.

A large representation including surgeons from Argentina, Austria, Bolivia, Canada, Chile, China, Cuba, Egypt, England, Finland, France, Haiti, Hungary, India, Italy, Mexico, Peru, Puerto Rico, Philippines, United States and Turkey, were present. A quorum of voting Officers, Trustees and Delegates answered the roll call, and Dr. Berg declared the meeting open for the transaction of business.

1. Unfinished Business of Preceding Session:

Dr. A. A. Berg gave his address as retiring President, from which limitations of space permit us to quote only the following:

"The frightful ravages of war have not interfered with our meetings, and we are exceedingly proud that at the last meeting in New York City during the war years, we brought to the surgeons of the Allied Armies stationed in the United States the latest and best practices in diagnosis, technic and treatment that science and experience afforded."

Dr. Berg explained the functions of the College, which are well known to all, warned against overtraining in our profession, and questioned whether the lengthy training that is demanded is essential except for specialists. "Is all this desirable or necessary? Did Ambroise Paré or Galen or Hunter or Lister or Billroth or Schimmelbush or Bastianelli or Putti or McDowell or Keen, have all these qualifications?

"Were these great surgeons made according to a set plan, or were they surgeons whom the Creator had touched with the divine spark of genius? How many young men today are excluded from the ranks of surgical organizations because they could not attain certain qualifications even though they have education, culture, imagination and genius? There is room here for our influence to be exerted, to bring light out of this turmoil and confusion." . . . "I see the future of this College in the years to come growing ever wider and wider, stronger and stronger, for we are brothers, workers all, ever reaping something new, earnest of the things that we will do."

2. Approval of Resolutions Presented in the Opening Session.

The Secretary read the Resolutions and Amendments presented at the Opening Session, and moved that all said Resolutions and Amendments as read and reread at this the Final Ses-

sion, be approved, confirmed, ratified, and incorporated into the Minutes of this meeting and in the Constitution and By-laws of the International College of Surgeons. The motion was seconded and unanimously carried.

3. Miscellaneous Business.

The Secretary presented a letter from Prof. A. Pazzini, professor of the History of Medicine at the University of Rome, who offered his cooperation in formulating plans for the establishment of a Museum of the History of Surgery at the Home of the College. This was unanimously approved, and the President announced that a Committee would be appointed to look further into the matter for a detailed evaluation of the plan.

The Secretary read a letter from Dr. William Carpenter MacCarty, Sr., of the Mayo Clinic, Rochester, Minnesota, in which he offered his services without remuneration to the International College of Surgeons as Field Representative, and outlined a plan of activity in that capacity.

Dr. MacCarty's offer was accepted with gratitude by the House of Delegates, details of his duties to be worked out later.

Election of Officers: The following officers and trustees were unanimously elected:

President, Dr. Francisco Graña, Lima, Peru

President-Elect, Dr. Herbert Acuff, Knoxville, Tennessee

Treasurer, Dr. Roland M. Klemme, St. Louis, Missouri

Vice-Presidents: Dr. Rudolph Nissen, New York, N. Y.; Dr. Manuel A. Manzanilla, Mexico City; Dr. Custis Lee Hall, Washington, D. C.; Mr. Hamilton Bailey, London, England; Dr. Raffaele Paolucci, Rome, Italy; Dr. Lyon H. Appleby, Vancouver, Canada; Dr. Felix Mandl, Vienna, Austria

Trustees: Dr. Lyon H. Appleby, Vancouver, Canada; Dr. Fahri Arel, Istanbul, Turkey; Dr. Charles H. Arnold, Lincoln, Nebraska; Dr. W. Wayne Babcock, Philadelphia, Pa.; Dr. Raffaele Bastianelli, Rome, Italy; Dr. Moses Behrend, Philadelphia, Pa.; Dr. Jacob Bitschai, Alexandria, Egypt; Dr. Alfredo Borjas, Caracas, Venezuela; Dr. Martial Bourand, Port-au-Prince, Haiti; Dr. Felipe Carranza, Buenos Aires, Argentine; Dr. Jorge Cavalier, Bogota, Colombia; Dr. Alejandro Ceballos, Buenos Aires, Argentine; Mr. Zachary Cope, London, England; Dr. R. N. Cooper, Bombay, India; Brig. Gen. M. M. Cruickshank, Aberdeen, Scotland; Dr. Raymond Darget, Bordeaux, France; Dr. Justin Djaneledze, Leningrad, U.S.S.R.; Dr. A. Mario Dogliotti, Torino, Italy; Dr. Francisco Fonseca Garcia, Mexico City; Dr. Jorge de Gouvea, Rio de Janeiro, Brazil; Dr. Endre Hedri, Budapest, Hungary; Dr. Elmer Hess, Erie, Pennsylvania; Dr. Oscar Ivanissevich, Buenos Aires, Argentine; Dr. Arnold Jirasek, Prague, Czechoslovakia; Dr. Kalle Kallio, Helsinki, Finland; Dr. J. Heng Liu, Shanghai, China; Dr. Wm. Carpenter MacCarty, Sr., Rochester, Minnesota; Dr. Felix Mandl, Vienna, Austria; Dr. Alfredo Monteiro, Rio de Janeiro, Brazil; Dr. Cesare A. Pantoja, Bogota, Colombia; Dr. Esteban Paulin, Queretaro, Mexico; Dr. Desiderio Román, Philadelphia, Pa.; Dr. Raul David de Sanson, Rio de Janeiro, Brazil; Dr. James K. Shen, Shanghai, China; Dr. Enrique St. Loup B., La Paz, Bolivia; Dr. Alex Spain, Dublin, Ireland; Dr. Miklos Temesvary, Budapest, Hungary; Dr. Manuel Tuason, Manila, P. I.

5. New Business.

Charters were accorded by the President to the Austrian and Philippine Chapters, who were welcomed into the International College of Surgeons.

The Closing Session of the House of Delegates adjourned at 3 P.M.

Thirteenth National Assembly, United States Chapter International College of Surgeons, St. Louis, Nov. 16-19, 1948

Drs. Roland M. Klemme and Vernon Mastin announce the thirteenth Annual Assembly and Convocation of the United States Chapter, International College of Surgeons, which is to be held in St. Louis from November 16 to 19, 1948.

Headquarters will be at the Kiel Auditorium.

The program of scientific sessions on subjects in the fields of general surgery; eye, ear, nose and throat surgery; gynecology and obstetrics; urology; and orthopedic, thoracic, plastic, and neurologic surgery, will be supplemented by operative and nonoperative clinics in hospitals in St. Louis and vicinity.

In addition there will be extensive technical

and scientific exhibits, as well as the showing of operations by motion pictures and, if possible, by television.

At the Convocation, which will be held on the final evening of the Assembly, a large group of surgeons will be received as Affiliates, Matriculates, Associates and Fellows.

The Committee on Arrangements plans that "International College Week" in St. Louis will be full to overflowing with activity. Sunday and Monday, November 14 and 15, the annual business meeting will occupy the attention of the officers of the College. Monday the hospitals of St. Louis will act as host to surgical operative clinics. Tuesday the scientific sessions will begin and continue daily through Friday. Tuesday evening the United States Chapter will be guests of the St. Louis Medical Society. Wednesday night a "Surprise Session" is planned. On Thursday night the Annual Banquet, and on Friday evening the colorful Convocation ceremonies will take place.

Entertainment for the surgeons' ladies will continue throughout the week.

An unusually fine technical exhibit will be presented by leading manufacturers of surgical instruments, x-ray apparatus, operating room and hospital equipment, pharmaceuticals and others.

Watch for the October issue of the JOURNAL *of the International College of Surgeons for detailed information on the program, but plan now to attend this meeting.*

For applications for membership in the United States Chapter, International College of Surgeons, address Dr. L. J. Gariepy, Secretary, 16401 Grand River Ave., Detroit, Michigan.

New Books

Identification of Tumors. By N. Chandler Foot, Philadelphia, J. B. Lippincott Company, 1948. This volume meets the need for a shorter book that will afford a concise but sufficiently adequate concept of the salient gross and microscopic features of the various neoplastic tumors of the human body.

The text has been systemically compiled. If the tumor is of general distribution, it is considered in the earlier chapters dealing with such growths. If it is peculiar to a certain organ, it is included in the later chapters dealing with tumors classified according to the various anatomic systems (alimentary, respiratory, etc.). The preferred name of each growth is presented, together with its less familiar synonym. Information regarding the tissues from which each variety originates, its usual site of incidence, age and sex of the patient it commonly afflicts, and any exceptionally important signs and symptoms, are then noted. Following this, there are short descriptions of the gross and microscopic features which permit recognition and diagnosis together with any variants which sometimes occur. Finally, the analogue of the tumor under discussion is indicated when it is not fairly obvious.

There are many superficially similar histologic appearances in the manifold tumors which afflict the human body; and, whenever any possible confusion may occur, the differential points in diagnosis are indicated. In this regard, the matter of specific and/or special staining and impregnation methods are considered and directions are given for carrying them out.

In Part 1 there are sections for tumors of fibrous tissue, cartilage and bone, muscle and fat. These are mesoblastic tumors. Other sections discuss tumors of the serous membranes, of the cardiovascular system, of epithelial tissues and of lymphoid tissue. Tumors of the spleen are included in the first section because of its multisystem construction.

Since Part 2 contains the descriptions of the tumors of the special systems and organs, the reason for the inclusion of tumors of the spleen and of the cardiovascular system in the first part of the book seems a little obscure. In Part 2 will be found tumors of the respiratory system and of the mediastinum, alimentary canal, liver, pancreas and biliary tract, and urinary system. There is a large section devoted to tumors of the organs of internal secretion. Tumors of the male and female reproductive system and of the breast are discussed independently. Tumors of the nervous system and of the skin comprise the next two sections. The book finally describes tumors of the eye and of the ear. There is a tabulator index of tumors and a general index at the end of the book.

This volume is intended to serve as a brief guide to the identity of tumors and to stimulate the further study of them. It contains no extended discussions as to theories of origin, no statistical tables, few clinical data and no lists of references. The author has pared its contents down to the very essentials necessary for the identification and the diagnosis of a given tumor with occasional references to other items. This has necessitated a rather arbitrary and didactic approach which, under circumstances, must be understood. For these many reasons the book is naturally somewhat limited, but it has a place for the beginner or for those with limited knowledge and experience with tumors in general. The deficiency is remedied, however, because suggestions are given whereby the reader can readily find larger and more comprehensive descriptions in the more inclusive textbooks, or in other monographic publications.

The format of the book is excellent. The text is well arranged and distributed. There are abundant well placed photomicrographic illustrations in black and white of each histologic type of tumor. When feasible and possible, the widely different appearances of a given tumor are so illustrated. Gross photographs are not provided and the reviewer agrees with the author that in a condensed book of this type they would add nothing of value.

Nouvelles Techniques de Traitement des Fractures. By H. Godard et R. Michel-Bechet, Goin & Co., Paris, 1948. This is a very concise and comprehensive volume covering all the major fractures with special emphasis on their treatment. There is, however, quite a tendency towards oversimplification.

As all French books, it is clear and brief. Several topics such as fractures of the hand are completely overlooked. Newer methods such as that of Kutsher's intramedullary pegging have been given ample consideration, perhaps more than they should have.

Operative Gynecology. By Josef Halban, edited by Luben Tr. Panoff, Vienna, Urban & Schwarzenberg, Ed. 2, 1947. The first edition of Prof. Josef Halban's book was published in 1932. Following the death of the author Doctor Panoff undertook the task of reediting the work. The publisher requested that "the character of the book should be strictly preserved," and that the editor's duty should be "confined to elimination of obsolete procedures, correction of obvious errors, and to short hints at newer discoveries." This request was followed a little too well. One searches in vain for any mention of the paramount discovery of penicillin. Also, the old direct method of blood transfusion is still adhered to.

In comparing this work with the two standard American textbooks on the subject, one finds the scope of operative gynecology greatly extended. In a book of this type one would not expect a chapter describing in detail Trendelenburg's pulmonary embolectomy, nor can nephrectomy be justly classified as a gynecologic operation.

In dealing with congenital absence of the vagina, Baldwin's and Schubert's methods are set forth in detail. "Both of these operations have higher mortality than can be justified by the condition" (Te Linde), and therefore have been abandoned in this country. The methods of neither Falls, Graves, nor McIndoe are mentioned.

The chapter on malposition of the uterus is worth-while reading. The author advocates treating retrodisplacement of the uterus by fixation of the uterus to the bladder either by the abdominal route (Werth) or through a vaginal incision (Mackenrodt-Halban). Both operations have the purpose of obliterating the vesicouterine space and are recommended in those cases where future pregnancies are desired.

The various forms of treatment of prolapse are depicted. In doing an anterior colporrhaphy, the author plicates the prevesical fascia by a single pursestring suture which most surgeons in this country would deem insufficient to insure permanent support of the bladder.

The Viennese group has always been famous for their excellent vaginal surgery; thus, it is not surprising that the author makes vaginal hysterectomy his operation of choice in cases of uterus myomatosus. If the size of the tumors makes the delivery of the fundus per vaginum impossible, he prefers the supracervical method with cauterization of the cervix to a total abdominal hysterectomy. Halban believes that a malignancy in the remaining cervical stump is very rare. This thought is contrary to the concept of American gynecologists who show an increasing trend toward routine total abdominal hysterectomy.

The chapter on carcinoma colli uteri is by far the most fascinating one of the entire book. Crossen and Crossen classify the two surgical methods of treating this disease, namely, the radical abdominal panhysterectomy (Wertheim), and the radical vaginal hysterectomy (Schuchhardt) as "operations of historical importance," and it was not until recently that Meigs revived interest in these procedures. The student interested in these procedures will find the pages dealing with radical surgery in cervical cancer most enlightening. It is regrettable, however, that the internationally accepted classification into the four stages has not been adopted in this work; it would have made the reading of this chapter much easier. For the same reason, the statistics are difficult to evaluate. Unfortunately, the author still adheres to the obsolete terms "operable" and "inoperable."

Although procedures usually are given by name, no references are included in the majority of cases. The print of the book is clear and easy to read, yet the quality of the paper as well as that of the cloth binding leave much to be desired. The illustrations are clear and of prewar quality.

The new edition of this book represents one of the first steps on the road of cultural renaissance of a nation which has been severely devastated by the recent war.

Foot and Ankle. By Philip Lewin, Philadelphia, Lea and Febiger, Ed. 3, 1947, 806 pp. This book completely covers everything pertaining to the foot and ankle. The chapters follow in natural sequence and discuss the principles of etiology, pathology, diagnosis and treatment. Acquired and congenital deformities are discussed and traumatic lesions, including fractures and dislocations, as well as industrial conditions are completely treated.

The volume is extremely practical and is not only recommended as a guide to students, but also to any practitioner who examines or treats foot or ankle conditions. This is a wide scope but it is adequately covered by this book. Considerable energy and thought has been expended on, and incorporated in, this revised text. Experiences from the recent war are a very valuable contribution. The author has presented what would seem to be the last word on foot and ankle conditions and is to be commended for placing a book of this caliber at our disposal.

Abstracts from Current Literature

Atypical Adynamic Ileus Apparently Caused by Nutritional (Thiamine Chloride) Deficiency, D. J. Leithauser, Surg. Gynec. & Obst. **86**:543, May 1948. Although recognition of digestive symptoms as a phase of vitamin B deficiency has been well established clinically and roentgenologically, the exact clinical syndrome described by the author has not been previously reported, judging by a search of the literature. In previous reports of digestive symptoms of vitamin B deficiency no emphasis was placed on the fact that severe and uncontrollable abdominal distention might lead to erroneous surgical diagnoses and needless operations. Reports are cited to show that the digestive symptoms accompanying vitamin B deficiencies are not constant and may manifest themselves in various syndromes, depending upon lack of particular food factors, duration of the deficiency, individual metabolic differences in ability to utilize them which in turn are influenced by various acute and chronic diseases. In the author's series the characteristic pathologic changes encountered were edema and thickening of the intestinal walls with engorgement of the blood vessels. In fatal cases in which roentgenologic changes had previously been demonstrated in the intestine, atrophy of the tunica muscularis and mucosa, edema, round cell infiltration and fibrosis of the submucosa and ulceration have been described. The type of pathologic changes and the variety of gastrointestinal symptoms suggest that it would be wise to suspect a nutritional disturbance in any case in which the digestive symptoms, clinical and radiologic findings seem atypical or anomalous. In this way the etiology of certain obscure gastrointestinal conditions might be elucidated, and it may be justifiable to raise the question whether nutritional deficiency may play a role in the causation of at least some cases of so-called nonspecific regional enteritis. In the absence of so-called characteristic lesions the response to therapy must be accepted as significant evidence that a nutritional disturbance is the cause of particular symptoms. Of the author's cases whose symptoms of adynamic ileus were dramatically relieved by administration of thiamine chloride and vitamin B complex only one had the characteristic stomatitis of vitamin B deficiency, and in two, stool examinations failed to reveal evidence of steatorrhea which is characteristic of advanced vitamin B deficiency known as the sprue syndrome. Possibly the syndrome described is more likely to occur in patients who have some liver damage (4 of the 6 cases were chronic alcoholics). The author's experience suggests that nutritional deficiency should be suspected, and a therapeutic trial of vitamins made, in cases of abdominal distention in which the evidence does not justify a positive diagnosis of mechanical obstruction of the intestines. It is also suggested that all surgical patients receive vitamin B complex parenterally before operation and for three days thereafter.

Cartilaginous-Cup Arthroplasty in Ununited Fractures of the Neck of the Femur, J. R. Moore, J. Bone and Joint Surg. (Am. Vol.) **30A**:313, April 1948. Cartilaginous-cup arthroplasty, devised by the author in 1938, properly should be regarded as a modification of the Brackett operation. It consists in removing the femoral head and reaming out the osseous portion until a cartilaginous cup with a very thin layer of bone (⅛ inch or less) remains. The cup then transmits light. The end of the femur is carefully rounded off with a cup reamer and the cartilaginous cup fitted to it. Femur with cartilaginous cup is returned to the acetabulum and the greater trochanter is reattached to the lateral aspect of the shaft 2 or 3 inches below the cup level. After careful closure of the wound in layers a double hip spica from ankle to nipple line is applied with the operated leg in maximum abduction (60 to 80 degrees) with the patella pointing straight up. Sometimes, in order to obtain the desired abduction (minimum of 60 degrees) an adductor tenotomy is required. Complete hemostasis, clamping and tying all vessels is essential. The cup must be fitted snugly and placed accurately on the end of the femur neither in valgus nor in varus and with neither anterior nor posterior tilting. Its position is maintained by wide abduction accomplished by abducting the femur until firm resistance is met.

Aseptic Gastric Resection, Billroth I Technic, A. Monteiro and H. Barreto (Brazil), Surgery **23**:178, Feb. 1948. The thorough hemostasis achieved may account for the success of the Monteiro technic. Since the vessels of the stomach lie in the submucous layer, a perfect crushing will tear this layer together with the mucosa and circular fibers of the muscularis. When crushing does not accomplish hemostasis the vessels which are withdrawn with the submucosa will continue to bleed into the cavity. The von Petz instrument performs the crushing but not a lamination that would pierce and permit the submucosa to retract. When the clips

are withdrawn and the sectioned surface is electrocoagulated, hemostasis is effected by directly reaching the layers with the vessels. This also frees the surface of bacteria.

Primary Nonspecific Ulcers of the Small Intestine, John A. Evert, B. M. Black and M. B. Dockerty, Surgery **23**:185, Feb. 1948. The dangers inherent in primary nonspecific ulcers of the small intestine are the complications which they may develop and the lack of symptoms before complications occur. Perforation is the most frequent complication (81 per cent). The mortality rate is high. Clinical diagnosis is obscure but the possibility of these lesions should be considered in patients who present a problem of gastrointestinal hemorrhage with no roentgenologic evidence of abnormality of esophagus, stomach, duodenum or colon; patients having symptoms or signs of peritonitis suggestive of ruptured peptic ulcer in whom no such perforation is found at laparotomy; and patients with recurrent postprandial pain suggestive of peptic ulcer but without x-ray evidence of such.

Use of Anticoagulants in the Surgery of Aneurysms and Arteriovenous Fistulas, with Particular Reference to Dicumarol, H. B. Shumacker, Jr., D. I. Abramson and H. H. Lampert, Surgery, **22**:910, Dec. 1947. In institutions in which it is economically feasible to provide facilities for accurate daily determinations for blood thrombin, the experience of the authors suggests that dicumarol has advantages over heparin in cost and in ease of administration. If these are not available the drug should not be used, for its uncontrolled administration is fraught with great danger. Under such circumstances heparin can be employed more safely. It is also suggested that it may be preferable to obtain adequate prothrombin levels preoperatively, using dicumarol, rather than to begin anticoagulant therapy with heparin at the time of the surgical procedure. Indications are that reparative procedures upon peripheral arteries can be safely undertaken when a full anticoagulant effect has been achieved with heparin, dicumarol, or both. Though no proof of the effectiveness of anticoagulants has been furnished, suggestive evidence has been obtained for the belief that such therapy renders less likely thrombosis of the repaired segment of artery.

Carcinoma of the Breast in the Absence of Clinical Breast Findings, Arnold S. Jackson, Ann. Surg. **127**:177, Jan. 1948. The difficulty confronting the clinician in the early detection of carcinoma of the breast is emphasized. Three cases are reported to illustrate the point. All three had been examined by several physicians but it was impossible to detect any clinical signs of pathologic abnormality in the breasts. All three came for examination because of the presence of a lump in the axilla. In the first patient histologic examination revealed carcinoma in the lymph node excised, and the patient was treated with radium packs to the axilla. Three years and four months after removal of the axillary node the primary growth became manifest in the breast. The next two patients were subjected to mastectomy on pathologic evidence of malignancy in the lymph node. Examination of the amputated breasts revealed, in one, several minute areas suggestive of carcinoma and several small nodes, and in the other several suspicious areas the size of a match head which could be palpated but hardly distinguished from the surrounding tissue and one node that appeared involved. Section revealed carcinoma.

Treatment of Postoperative Swelling of the Arm Following Mastectomy, Henry A. Hanelin, Jonathan M. Williams, S. M. Wolffson, and E. D. Wernick, Arch. Surg. **55**:723, Dec. 1947. Patients suffering from postmastectomy swelling of the arm were treated with injections into the stellate ganglion of 5 cc. of a 1 per cent solution of procaine hydrochloride at periodic intervals. Subjective and clinical improvement was revealed in 80 per cent, and in 60 per cent an average reduction of ¾ inch (2 cm.) in the size of the involved extremity was manifested. No improvement was noted in patients who were not treated by paravertebral block.